7

THE RECONSTRUCTIVE NATURE OF MEMORY

CHAPTER OUTLINE

SETTING THE STAGE

In 2 short months, my younger child will start ninth grade at the local public high school, making a transition from a small charter middle school. As we talk about the transition, I'm reminded of my own similar transition, going from eighth grade in a small Catholic school (with 37 students in the class) to a relatively large ninth grade (400 in the class) in a much larger building with a much larger staff.

I vividly remember my first day. I remember a fight with my mom over what I was going to wear (she vetoed my miniskirt). I remember walking by my old school and smelling the lilacs in full bloom. I remember having trouble finding my locker and my homeroom. I remember a senior meeting me in the cafeteria and helping me to figure out where my second-period class was. I remember my math teacher teasing me and my being mortified—my name on his class roster showed up as "Dathie," and he insisted on calling me that all year.

Although my memories are vivid, my reading of the memory literature strongly suggests to me that some parts of these memories might be wrong. For example, lilacs bloom in the spring; my first day of ninth grade was in September. It's unlikely that I smelled lilacs on that particular day simply because they wouldn't have been in bloom. My mom and I had several disputes about appropriate clothing choices for school; whether or not one of them happened on that particular day is less clear. Ditto the issue of my math teacher calling me by the incorrect "Dathie" moniker (which, by the way, continued to be mortifying the

entire year); he may well have waited until the second day or later to do so.

If my memories aren't completely correct, what has happened? It's likely, as we will see in this chapter, that various errors crept into the stored memories. I may have gotten some dates mixed up. I may have substituted something that happened on a different day for something that happened on that particular first day. I may have remembered things that frequently happened (my math teacher tortured me frequently with the whole "Dathie" thing) and edited them into my memory for a specific day. As we will see in this chapter, memory is malleable, meaning that it can be easily changed and reshaped, often without our awareness.

NARRATIVE MEMORY

So far, we have concentrated on laboratory studies of memory. This tradition dates back at least to Hermann Ebbinghaus. One can't help admiring Ebbinghaus's dedication and feeling gratitude for his many insights about memory. However, a similarly common reaction is to find his efforts somewhat amusing. After all, what relevance do his heroic studies have to memory in "real life"? Does the study of memory for nonsense syllables really tell us very much about how to study for an upcoming midterm, how to remember where we left our house key, or how we recall our first day of kindergarten (if in fact we remember anything about it)?

Another pioneer in the study of memory, Sir Frederic Bartlett, rejected the emphasis on laboratory studies of memory. Bartlett (1932) believed that in the real world (as opposed to the laboratory) memory largely uses world knowledge and **schemata**—frameworks for organizing information. According to Bartlett, at retrieval time this knowledge and organizational information are used to reconstruct the material. Bartlett tested both friends and students, first presenting them with stories such as the one in Box 7.1.

Box 7.1

"The War of the Ghosts": A Story Used by Bartlett (1932) to Investigate Long-Term Memory

One night two young men from Egulac went down to the river to hunt seals, and while they were there it became foggy and calm. Then they heard war-cries, and they thought: "Maybe this is a war-party." They escaped to the shore, and hid behind a log.

Now canoes came up, and they heard the noise of paddles, and saw one canoe coming up to them. There were five men in the canoe, and they said: "What do you think? We wish to take you along. We are going up the river to make war on the people." One of the young men said: "I have no arrows." "Arrows are in the canoe," they said.

"I will not go along. I might be killed. My relatives do not know where I have gone. But you," he said, turning to the other, "may go with them." So one of the young men went, but the other returned home.

And the warriors went on up the river to a town on the other side of Kalama. The people came down to the water, and they began to fight, and many were killed. But presently the young man heard one of the warriors say: "Quick, let us go home: that Indian has been hit." Now he thought: "Oh, they are ghosts." He did not feel sick, but they said he had been shot.

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So the canoes went back to Egulac, and the young man went ashore to his house, and made a fire. And he told everybody and said: "Behold I accompanied the ghosts, and we went to fight. Many of our fellows were killed, and many of those who attacked us were killed. They said I was hit, and I did not feel sick." He told it all, and then he became quiet. When the sun rose he fell down. Something black came out of his mouth. His face became contorted. The people jumped up and cried.

He was dead.

Source: Bartlett, F. C. (1995). *Remembering: A study in experimental and social psychology,* 2nd edition. Cambridge, UK: Cambridge University Press, p. 67. Reprinted with the permission of Cambridge University Press.

Bartlett used the **method of serial reproduction**, meaning participants were asked to recall the stories on more than one occasion. Participants were asked to recall the tales at varying intervals, some as long as years. Bartlett was interested in what information was remembered and what information was "misremembered"—distorted or reordered in the participants' recollections. Box 7.2 provides examples of repeated recollections of the "War of the Ghosts" story as retold by one participant. This retelling shows concretely that over time the same person's recall becomes more distorted.

Box 7.2

One Participant's Recall of "The War of the Ghosts"

Recalled 15 minutes after hearing story:

The Ghosts

There were two men on the banks of the river near Egulac. They heard the sound of paddles, and a canoe with five men in it appeared, who called to them, saying: "We are going to fight the people. Will you come with us?" One of the two men answered, saying: "Our relations do not know where we are, and we have not got any arrows." They answered: "There are arrows in the canoe." So the man went, and they fought the people, and then he heard them saying: "An Indian is killed, let us return." So he returned to Egulac, and told them he knew they were ghosts.

He spoke to the people of Egulac, and told them that he had fought with the Ghosts, and many men were killed on both sides, and that he was wounded, but felt nothing. He lay down and became calmer, and in the night he was convulsed, and something black came out of his mouth.

The people said: "He is dead."

Recalled 2 weeks later:

The Ghosts

There were two men on the banks of a river near the village of Etishu (?). They heard the sound of paddles coming from the up-stream, and shortly a canoe appeared. The men in the canoe spoke, saying: "We are going to fight the people: will you come with us?"

One of the young men answered, saying: "Our relations do not know where we are; but my companion may go with you. Besides, we have no arrows."

So the young man went with them, and they fought the people, and many were killed on both sides. And then he heard shouting: "The Indian is wounded; let us return." And he heard the people say: "They are the Ghosts." He did not know he was wounded, and returned to Etishu (?). The people collected round him and bathed his wounds, and he said he had fought with the Ghosts. Then he became quiet. But in the night he was convulsed, and something black came out of his mouth.

And the people cried: "He is dead."

Source: Bartlett, F. C. (1995). *Remembering: A study in experimental and social psychology,* 2nd edition. Cambridge, UK: Cambridge University Press, pp. 68–69. Reprinted with the permission of Cambridge University Press.

Bartlett used this evidence to argue for a constructive view of long-term memory. He believed that participants unintentionally introduced the distortions to make the material more rational and more coherent from their own point of view. Interestingly, the original story, a Native American folktale, was often "misrecalled" in ways more consistent with people's cultural conventions for stories. Thus, the "foggy and calm" weather might be changed to a "dark and stormy night"—something more in keeping with a Western assumption of how weather portends bad events. Thus, Bartlett rejected the idea of long-term memory as a warehouse where material is stored unchanged until retrieval. Rather, he saw memory as an active and often inaccurate process that encodes and retrieves information so as to "make sense."

Psychologist Ulric Neisser, a major figure in the study of memory, offered related arguments regarding studying memory in natural settings. Neisser (1982a) was skeptical of the assumption that laboratory studies of memory are necessarily relevant to memory in natural settings; rather, he believed that laboratory studies are of limited value in understanding the use of memory in everyday life. Neisser called for the study of how people construct and use memories of their own past experiences, how they remember events of historical significance, how they use memory to plan and carry out everyday errands, and so on. In the sections to come, we will take up some of these questions.

AUTOBIOGRAPHICAL MEMORY

Marigold Linton (1982) conducted a study that nicely demonstrates the kind of research Neisser was calling for. Like Ebbinghaus, Linton studied her own memory. Her methods of data collection, like those of Ebbinghaus, had a heroic quality: Every day for 6 years (!), she wrote brief descriptions of two (or more) events that had happened that day. Each month, she conducted tests of her memory. Unlike Ebbinghaus, Linton was recording and testing memories of actual life events that had happened to her, not experimental materials. Linton described her methodology in the quote below:

> Memory tests proceeded as follows: Once a month items were drawn semi-randomly from the accumulated event pool. After reading a pair of randomly paired event descriptions, I estimated their chronological order and attempted to reconstruct each item's date. Next, I briefly classified my memory search (for example, I might "count backwards" through a series of similar events, as school quarters, Psychonomic Society meetings, and the like) and reevaluated each item's salience. After six years the experiment had reached imposing dimensions. I had written

> more than 5,500 items (a minimum of two times each day) and tested (or retested) 11,000 items (about 150 items each month). Item generation required only a few minutes each day but the monthly test was extremely laborious, lasting 6–12 hours. (pp. 78–79)

Linton (1982) found that some items were easily retrievable; any description such as "I did *X* for the first time" (e.g., went to New York, met a famous psychologist) was very memorable. Other items became harder and harder to recall, especially when the written description did not pertain to a single distinctive event.

This is a good example of a classic study of **autobiographical memory**—that is, memory for events that the rememberer has been part of. During the first 20 months of the study, Linton recorded 2,003 events and tested 3,006 (1,468 of these were retests of previously tested items). She had expected, before running the study, that she would quickly forget many of the items, but in fact that did not happen, perhaps because she needed only to recognize the events (not recall them) and date them, not answer detailed questions about them. In fact, Linton's results suggest that real-world memories are much more durable than those of most laboratory experiments.

Linton also recorded protocols of herself thinking aloud (a technique discussed in Chapter 11) as she tried to date items. She found that she often used problem-solving strategies to arrive at a date even when she had no explicit recall of the event. You might be able to re-create this phenomenon by trying to answer the following question: Where were you on June 28, 2016, at 11:35 AM? Your first reaction may be to laugh and claim you can't possibly answer the question. But think about it. No doubt you can find some "markers" that point you toward some sort of answer. For instance, you might note that the latter part of June is during the summer. You might be able to figure out June 28 must have been a Tuesday because (say) your mother's birthday is June 25 and you remember that being a Saturday. You might remember you held a summer job at a local department store and conclude that at 11:35 on June 28 you must have been working, probably stocking shelves. Notice that what you've done is to zero in on the date and time by finding and using different markers. You haven't necessarily *remembered* what you were doing; instead, you've reconstructed it.

Linton (1982) also reported on "unrecalled" items and found them to be of (at least) two types. Some items were simply not recalled; that is, the descriptions she originally reported did not serve to bring to mind any recollections of the events when they were tested. However, at least as many "forgotten" items were ones Linton found herself unable to distinguish from other similar memories.

Robinson and Swanson (1990) offered an explanation of Linton's findings on "unrecalled" items. They suggested that as similar events are repeated, the similar aspects start to form an event schema. That is, as Linton repeatedly experienced an event such as sending what she believed to be a "final" draft of her book to her publisher, which in fact she would subsequently need to rewrite and submit, memory traces of the specific instances of the different events fused together and became indistinguishable. Linton (1982) herself talked about a transformation from episodic to semantic memory.

Barsalou (1988) reported findings consistent with Robinson and Swanson's (1990) proposal. He and his collaborators stopped people on the campus of Emory University during the fall semester and asked whoever agreed to participate to describe events they were involved with during the preceding summer. Although people were asked to report and describe specific events, only 21% of the recollections collected could be

categorized as specific recollections. Instead, people were more likely to give "summarized events," statements that referred to two or more events of a certain kind such as "I went to the beach every day for a week." These summarized events made up almost a third of the recollections collected. People also reported what Barsalou called an "extended event," a single event lasting longer than a day such as "I worked at a camp for disadvantaged children." Even when Barsalou and his associates pointedly tried to elicit only specific event recollections, their participants still tended to report extended or summarized events.

Brewer (1988) took a different methodological approach to studying recall for ordinary events. He found eight very cooperative undergraduates to serve in a demanding multiweek experiment. During the data acquisition phase, participants were asked to wear beepers programmed to go off on a random schedule about once every 2 hours. When their beepers sounded, participants were asked to fill out a card with information about the event that was occurring when the beepers went off. Specifically, participants were asked to report the time and their location, actions, and thoughts and then to complete a number of rating scales (rating such things as how often this kind of event occurred, how pleasant the event was, and how trivial or significant it was). Fortunately, participants were given the option of recording the word "private" on the card instead of giving a detailed account if the activity they were engaged in was one they preferred for any reason not to report. Brewer noted that most participants exercised this option at least occasionally, which no doubt led to some systematic undersampling of certain kinds of events such as dating and parties.

This methodology, Brewer (1988) argued, had certain advantages over the one Linton used. Obviously, it involves separating the experimenter from the participant, which methodologically has many advantages. More important, however, Brewer argued that Linton wrote down the most "memorable" events of each day, which would tend to skew the set of items to be remembered. Brewer compared Linton's technique to one in which a laboratory participant in an experiment is given lists of hundreds of words each day and is asked at the end of each day to select one word to use in later testing. To compare these techniques, Brewer also asked his participants to list the most memorable event of each day.

Brewer (1988) later tested his participants' recall of the events they had recorded on cards. Each participant was tested three times: once at the conclusion of the data acquisition period, once about 21.2 months later, and once about 41.2 months after the end of the acquisition period. Items tested were randomly selected from all items the participants had initially described.

Brewer (1988) reported very good overall retention from his participants, who recognized more than 60% of the events. Memory was better for actions than for thoughts and was better for "memorable" events than for events randomly prompted by beepers. Consistent with some of the results Linton (1975, 1982) reported, Brewer found that events that occurred in unique or infrequent locations were better remembered than occurrences that occurred in frequented locations. Similarly, rare actions were more likely to be recalled than frequent actions. Interestingly, the time period of study encompassed the Thanksgiving break for Brewer's participants. Memories from that mini vacation were recalled especially well. The reason for this, Brewer argued, was that these trips were taken during the participants' first trip home from college (all the participants were first-year students). Those trips, he believed, were likely to be quite distinctive, especially in comparison with the routine events of going to class and studying that preceded and followed the vacation. Brewer concluded that the more

Photo 7.1: Memories of the first Thanksgiving home after starting college are likely to be especially memorable.

distinct the mental representation of an event, the more likely it is to be recalled, a conclusion similar to the one Linton reached.

In summary, Brewer (1988) concluded that autobiographical memories, while showing many of the phenomena demonstrated in laboratory studies, also showed important differences. Few overt recall errors were found, suggesting to Brewer that "personal memories are reasonably accurate copies of the individual's original phenomenal experiences" (p. 87).

Patricia Bauer and her students (Bauer, Tasdemir-Ozdes, & Larkina, 2014) have explored another aspect of autobiographical memories, specifically from what age the earliest autobiographical memories date. Research into this question dates back to the 1800s, when the phenomenon of **infantile amnesia** or **childhood amnesia** was first reported. Briefly defined, these terms refer to the fact that, when asked, most people can't remember anything from their first years of life. Bauer and her associates noted that one's first autobiographical memory sets a sort of marker on one's life narrative, a "stable beginning of a continuous sense of self over time and a reliable opening to the first chapter of one's life store or personal past" (p. 85).

Bauer and her students (2014) interviewed 36 women (mothers whose children were taking part in another study of autobiographical memory). These women visited Bauer's laboratory ever year for 4 years, and they were interviewed while their children were engaged in the other study. They were each given the open-ended prompt, "Please tell me about your earliest memory," and then were prompted to say how old they were when the recalled memory occurred. Investigators compared the responses of the same women on different occasions. Box 7.3 presents an example of recollections from one participant on two different occasions:

Box 7.3

Examples of Reports From Women in the Bauer et al. (2014) Study

Report 1: I remember a vacation, and we went to this Flintstone World place in South Dakota, and I remember crawling through this crocodile, it was like a play area tunnel thing and I remember getting to the middle and getting scared. And I remember getting stuck in there, and I remember my brother sticking his face in at one side of the tunnel saying "Come on its okay, come over here." And we had a foster brother also, who was at the other end trying to say "Go ahead, it's alright, it's not scary." And that's the only thing I remember about that whole place is being, like getting freaked out as soon as I go in the tunnel. And by looking at family pictures and things, and which foster brother, and stuff, I was three.

Report 2: The earliest memory, we were at, we were going go the Black Hills, and there's a Fred Flintstone World somewhere over there. And I remember being there, I remember crawling through like a ceramic alligator, crocodile one of those dinosaur type things, and getting to the middle and getting scared, 'cause it got dark and there were lights in the middle the kids would block. And I remember getting scared in the middle and crying, and then my brother was at one end, you know, telling me "to come on, it would be alright." I specifically remember that 'cause I was scared. I remember being scared. And it was green, and it was like a tube, just like a tunnel to crawl through but it was some sort of animal and I got scared. And they had to convince me to come out.

Source: Reprinted from Bauer, P. J., Tasdemir-Ozdes, A., & Larkina, M. (2014). Adults' reports of their earliest memories: Consistency in events, ages, and narrative characteristics over time. *Consciousness and Cognition, 27*, pp. 76–88. Copyright © 2014, with permission from Elsevier.

As you can see, the two reports in Box 7.3 are describing what seems to be the same incident. They aren't word-for-word identical, and we wouldn't really expect them to be unless the participant had memorized a specific wording of the recollection and trotted it out on two different occasions. Nonetheless, the details she provides (e.g., the Flintstone park, the crocodile tunnel, the brother at one end, her being "stuck" in the middle and afraid) make it likely that she is indeed recalling the same incident in both recollections.

Other researchers echo Bauer et al.'s (2014) proposal that autobiographical memory is more than just a storehouse of personal recollections. Fivush, Habermas, Waters, and Zaman (2011), for example, see it as a "uniquely human form of memory that integrates individual experiences of self with culture frames for understanding identities and lives" (p. 321). That is, our autobiographical memories are an important means for constructing and interpreting our own sense of who we are, what our goals and values are, and they may even form a basis for our thinking about our lives in the future (Grysman & Hudson, 2011, 2013; Grysman, Prabhakar, Anglin, & Hudson, 2015).

FLASHBULB MEMORIES

Where were you when you learned of the terrorist attack on the World Trade Center on September 11, 2001? Many of us recall information not only about the tragic disaster itself but also about where we were, whom we were with, and what we were doing when we first heard about it. For example, I was standing in line at Goodbye, Blue Monday, my town's local coffee store. I'd just had my hair done and was thinking about all the things I needed to do that day when a woman in a pink dress behind me tapped me on the arm and asked if I'd heard the news. When I got to my car, I turned on the radio, and I hurried to school to use my computer to surf the Web. For most of the day I listened to the radio, surfed the Web, and talked in horrified tones to coworkers. That evening, I took my 8-year-old son to an on-campus service of remembrance. The day seems etched permanently in my memory.

R. Brown and Kulik (1977) coined the term **flashbulb memory** to describe this phenomenon. Other examples might be found in your parents' or other relatives' recollections of where they were when they heard about the assassinations of President John F. Kennedy and civil rights movement leader Martin Luther King, Jr. One study reports on flashbulb memories among Danish World War II veterans of the invasion and liberation of Denmark (Berntsen & Thomsen, 2005). Given the historical importance and surprising nature of these events, it may be small wonder that most of us old enough to have experienced them remember them. Why, however, do we

Photo 7.2: Most people old enough to understand what was happening in the 9/11 attacks have durable memories of where they were when they received the news.

remember details about our own circumstances when we first heard the news? Some have argued that part of the explanation involves our physiological response when we hear such news; parts of the brain that are involved in emotional responses activate, and the cognitive effects of this activation result in the storage of a great deal of information only indirectly related to the main information (R. Brown & Kulik, 1977). Pillemer (1984) found, for example, that his participants who reported a stronger emotional reaction to the news of the assassination attempt on President Ronald Reagan had stronger and more detailed flashbulb memories of that event.

Neisser (1982b) offered a different explanation for the origin of flashbulb memories: People are finding a way to link themselves to history. Flashbulb memories come about because the strong emotions produced by the event prompt people to retell their own stories of where they were when they heard the news. Flashbulb memories, then, result from the retellings of stories. Over time, the memories can become distorted in much the same way as participants in Bartlett's (1932) study distorted their retellings of the "War of the Ghosts" story; people elaborate and fill in gaps in their stories, making them approximate a standard story format.

Stephen Schmidt (2004) offered results of a study on people's flashbulb memories for 9/11. Undergraduates at his university (Middle Tennessee State) filled out survey instruments asking for their recall of the events of 9/11 beginning the very next day (September 12, 2001). Students were also resurveyed 2 months later. In this way, Schmidt was able to compare recollections across a 2-month time span. Almost all of his participants were able to report basic flashbulb information: who told them about 9/11, where they were when they first heard the news, what activity they were engaged in when they first heard the news, what they were wearing, what the weather was like, and so forth. Students showed greater consistency in answering what Schmidt called "central" questions, such as the first three in the list above, and less consistency in answering "peripheral" questions, such as what they were wearing. However, contrary to prediction, Schmidt found that those participants who initially reported the strongest emotional reaction to the events of 9/11 showed the most impairment in their memory. Interestingly, Daniel Greenberg (2004) analyzed news reports to show that President George W. Bush demonstrated substantial inaccuracies in his own flashbulb memories of the events of that day. Arguably, as the sitting president during the events of 9/11, his reaction was powerfully emotional.

In 2015, Hirst, Phelps, and a consortium of psychologists published data from a 10-year follow-up to memories of 9/11 (Hirst et al., 2015). They compared people's flashbulb memories (i.e., their memories for their personal circumstances of hearing about the events of 9/11) with their **event memories** (i.e., their memories of the events of 9/11 themselves). A little over 3,000 participants were originally recruited between September 17 and 24, 2001; most of these came from New Haven, CT; New York, NY; Washington, DC; St. Louis, MO; Palo Alto, CA; and Santa Cruz, CA. Participants

were surveyed again 1 year later, 3 years later, and 10 years later. An additional sample (individuals who had not previously been surveyed) was recruited by the Web 10 years after 9/11.

The authors found that there was rapid forgetting of both types of memories during the first year (i.e., from 2001 to 2002), but after that forgetting seemed to level off. In contrast, participants' *confidence* in their recall did not diminish over the 10 years. The investigators looked to see whether various factors, such as attention to media reports, discussion of the events with others, place of residency, and emotional intensity of the event, would predict the consistency of flashbulb memories over time; none did. In contrast, attention to media reports and amount of discussion with others did predict event memory accuracy. Echoing the reports of Bartlett, the authors found that once an inconsistency entered a flashbulb memory report, it tended to be repeated in subsequent reports. In contrast, errors in event memory tended to be corrected over time.

The question of whether flashbulb memories differ in kind from other types of memories has been actively debated (see, e.g., N. J. Cohen, McCloskey, & Wible, 1990; McCloskey, Wible, & Cohen, 1988; Pillemer, 1990). McCloskey et al. (1988), for example, found evidence that some flashbulb memories are quite inaccurate and that the kinds of forgetting and distortion evident in flashbulb memories can be predicted on the basis of traditional studies of ordinary memory. Hirst and Phelps (2016), in a recent review of the flashbulb memory literature, concurred with this conclusion and pointed to the role of media attention in the formation of flashbulb memories.

Weaver (1993) reported on a relevant and well-timed study of flashbulb memories. In January 1991, Weaver asked students enrolled in an upper-division psychology class to try to remember, in detail, their very next meeting with their roommate (or friend if they were living alone). Specifically, students were urged to do their best to remember "all the circumstances surrounding" that meeting (without being told specifically what kinds of things to try to remember). Weaver's intention was to see whether the memories formed of these routine meetings would function in ways similar to flashbulb memories, and he distributed a sealed questionnaire for students to fill out as soon as feasible after the meeting.

As it happened, that very evening the first President George Bush announced the initial attacks on Iraq in the Persian Gulf War. Although expected and thus not terribly surprising, it was an event of great consequentiality, especially to people with friends or relatives involved. Thus, this event seemed likely to be one for which flashbulb memories would be formed. Weaver, reacting quickly, created another questionnaire asking about students' memories of hearing about Bush's announcement. Students filled out this second questionnaire 2 days later. Weaver (1993) gave similar questionnaires about both memories (bombing of Iraq and meeting with roommate/friend), which students completed in April 1991 (3 months after the original events) and January 1992 (1 year after the original events).

Weaver (1993) found very few differences in accuracy for the two memories (as measured by the degree of correspondence between the January 1991 descriptions and the two subsequent ones). Weaver reported that accuracy for both fell off in an Ebbinghaus-like pattern: less accuracy after 3 months but relatively little change from 3 to 12 months. What did differ, however, was students' confidence in their memories. Students were much more confident in their memories of the Persian Gulf bombing than in their memory of meeting their friend or roommate. However, the increased confidence did not lead to increased accuracy.

Weaver (1993) concluded that no "flash" is necessary to form a flashbulb memory; having an intention to remember a particular meeting or event seems enough to ensure forming some memory of it. The flash, he believed, affects only our confidence in our memory. What makes flashbulb memories special, he argued, is in part the "undue confidence placed in the accuracy of those memories" (p. 45). Although this last assertion is sure to be controversial, probably no cognitive psychologist would disagree with another of Weaver's conclusions: "Flashbulb memories for exceptional events will continue to be studied, for obvious and interesting reasons. They are rare, unique, and universal" (p. 45). However, Weaver and others reject the idea that flashbulb memories rely on special memory mechanisms.

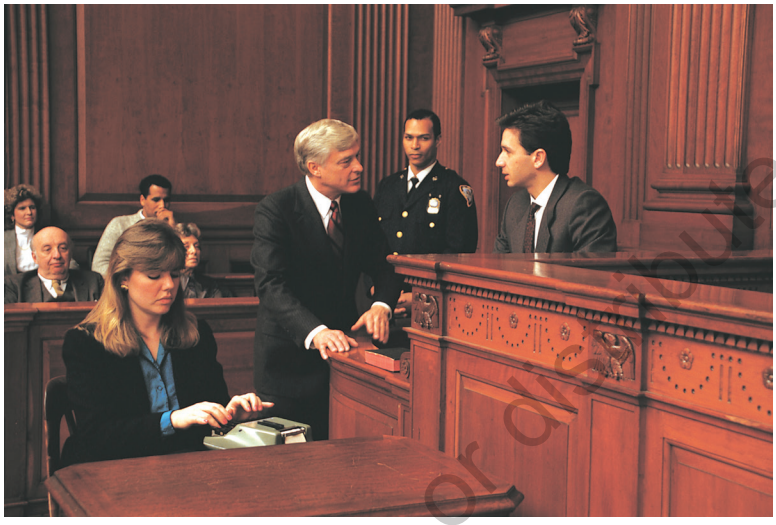
EYEWITNESS MEMORY

Imagine yourself as a juror assigned to a robbery/murder case. The defendant, a young man, is alleged to have robbed and killed a convenience store clerk at gunpoint at around 11 PM. No physical evidence (such as fingerprints or fiber samples) links the defendant to the crime. Instead, the case hinges on the sworn testimony of a convenience store patron who insists that the defendant is the man she saw on the night in question. In cross-examination, the defense attorney gets the witness to agree that the lighting was poor, the robber was wearing a stocking cap over his face, she was nervous and paying more attention to the gun than to the face of the robber, and so on. Nevertheless, the witness remains convinced that the defendant is the man she saw rob and murder the store clerk that night.

How much would the eyewitness testimony convince you of the defendant's guilt? Elizabeth Loftus, a cognitive psychologist specializing in the study of **eyewitness memory**, would argue that the testimony would have a disproportionate effect on your behavior. Loftus (1979) stated that "eyewitness testimony is likely to be believed by jurors, especially when it is offered with a high level of confidence," even when the confident witness is inaccurate. Indeed, she believed that "all the evidence points rather strikingly to the conclusion that there is almost nothing more convincing than a live human being who takes the stand, points a finger at the defendant, and says 'That's the one'!" (p. 19). Several studies Loftus reviewed, however, suggest that confidence in eyewitness testimony may be far too strong.

In one study, for example, participants viewed a series of slides depicting a (simulated) automobile accident. The automobile, a red Datsun, came to either a stop sign (for half the participants) or a yield sign (for the other half) before becoming involved in an accident with a pedestrian. The experimental manipulation came in the questioning that followed the slide show. About half of the participants (half of whom had seen a stop sign; the other half had seen a yield sign) were asked, "Did another car pass the red Datsun while it was stopped at the stop sign?" The other half of the participants were asked, "Did another car pass the red Datsun while it was stopped at the yield sign?" After answering these and other apparently routine questions, participants worked on an unrelated activity for 20 minutes. Then they were given a recognition test of several slides. Included in the test was a critical test pair depicting a red Datsun stopped at either a stop sign or a yield sign. Participants were to decide which of the two slides they had originally seen. Those who received a question consistent with the slide originally seen (e.g., a question about the stop sign when the slide they had previously seen contained a stop sign, not a yield sign) correctly recognized the slide 75% of the time. Participants who received an inconsistent question, however, had an overall accuracy rate of 41%, a dramatic decrease given that guessing alone would have produced an overall accuracy rate of 50%.

Other studies by Loftus (1975) have demonstrated that people's memories can apparently be altered by presenting misleading questions. For example, some participants viewed a film and were then asked, "How fast was the white sports car going when it passed the barn while traveling along the country road?" Other participants were merely asked, "How fast was the white sports car going while traveling along the country road?" Actually, no barn was presented in the film. One week later, all participants were asked whether they had seen a barn. Fewer than 3% of the participants in the second condition reported having seen a barn, whereas 17% of the participants who had been asked the misleading question reported having seen a barn. Lane, Mather, Villa, and Morita (2001) found that experimental "witnesses" who were asked to focus on specific details of a videotaped crime were more likely to confuse what they'd witnessed with the information given to them in postevent questions than were "witnesses" who were asked only to summarize the major aspects of the crime. Cochran, Greenspan, Bogart, and Loftus (2016) found that altering people's memory reports went undetected in the majority of the cases. Moreover, experimental "witnesses" tended to incorporate the misinformation into their subsequent reported memories.



■ Photo 7.3: Although eyewitness testimony often has dramatic effects on jurors' decision making, research suggests it is not always accurate.

"Memory malleability" fits well with some laboratory studies of sentence recall; both support Bartlett's conception of memory as a constructive process. A classic study by Bransford, Barclay, and Franks (1971) illustrates this idea. The authors gave participants a list of sentences, all derived from four basic sentences, such as "The ants were in the kitchen," "The jelly was on the table," "The jelly was sweet," and "The ants ate the jelly." The sentences the participants saw included two of the preceding sentences, combinations of two of the simple sentences (e.g., "The sweet jelly was on the table"), and combinations of three of the simple sentences (e.g., "The ants ate the sweet jelly on the table"). On a later recognition test, the participants were asked to decide, for each sentence presented, whether they had seen that exact sentence before and to rate their confidence in their judgment. They were most confident in "recognizing" the sentence that combined all four of the simple sentences, "The ants in the kitchen ate the sweet jelly that was on the table," even though it had never been presented.

Bransford et al. (1971) explained that the participants had not stored a copy of the actually presented sentences in memory. Instead, they had abstracted and reorganized the information in the sentences, integrating the ideas and storing the integration. The participants later could not distinguish between the presented sentences and their own integration. One might argue this is just what Loftus's participants were doing: integrating the original memories with later questions. If the later questions were misleading, that incorrect information became integrated with the original memory to produce a distorted memory.

Some work in cognitive psychology laboratories has focused on how to improve the chances of accuracy in eyewitness identification. Wells (1993) reviewed some of the

findings and made specific suggestions on how police might set up lineups and photo lineups so as to reduce the chances of eyewitness error. For example, he suggested having "mock" witnesses, people who were not present during the crime but who have been given limited information about the crime. The logic here is that the mock witnesses should be equally likely to choose any of the people in a lineup. If, however, the mock witnesses all "identify" the actual suspect, that is evidence that the lineup has been put together in a biased way. Other investigators have offered other suggestions for how to decrease eyewitness suggestibility (K. L. Chambers & Zaragoza, 2001), such as warning people against being misled by tricky questions.

However, there remains active and often very sharp debate over how well the findings of laboratory studies can be extrapolated to real-world settings. Typically, research participants view staged events or even movies or slides of incidents. This experience might not be very similar to that of a bystander who observes an actual robbery, assault, murder, terrorist attack, or other kind of crime. Moreover, it seems quite possible that victims or possible victims of crime may attend to different aspects of the situation than bystanders. Yuille (1993) argued that we need more justification to assume that research participants are subject to the same influences as witnesses (or victims) of real crimes.

THE RECOVERED/FALSE MEMORY DEBATE

One of the biggest debates to erupt in cognitive psychology during recent years concerns issues of forgetting, retrieving, and creating autobiographical memories. The debate has far-reaching implications well beyond the boundaries of an experimental laboratory. At stake are issues that touch, and indeed tear apart, the lives of real people. The issues concern whether victims of abuse can and/or do repress memories of incidents of abuse, retrieving these so-called **recovered memories** later in therapy, or whether instead some therapists (in fact, a small minority), misinformed about the workings of memory, inadvertently prompt their clients to create **false memories** of things that never really happened.

Note that the topics of eyewitness testimony and false versus recovered memories share many similarities; both essentially involve the alleged witnessing of an event, sometimes traumatic, often followed later by newer distorting information. But differences between the topics should also be kept in mind. In the case of eyewitness testimony, the issue is typically focused on recall for information acquired within the past few days, weeks, or months. In the case of false or recovered memories, the issue is whether one can recall information from several years to several decades earlier.

Loftus is again an active participant in the debate over whether such "recalls" represent recovered or false memories. She began a review article (Loftus, 1993) on the phenomenon with an anecdote:

> In 1990, a landmark case went to trial in Redwood City, California. The defendant, George Franklin, Sr., 51 years old, stood trial for a murder that had occurred more than 20 years earlier. The victim, 8-year-old Susan Kay Nason, was murdered on September 22, 1969. Franklin's daughter, Eileen, only 8 years old herself at the time of the murder, provided the major evidence against her father. What was unusual about the case is that Eileen's memory of witnessing the murder had been repressed for more than 20 years.

Eileen's memory did not come back all at once. She claimed that her first flashback came one afternoon in January 1989 when she was playing with her 2-year-old son, Aaron, and her 5-year-old daughter, Jessica. At one moment, Jessica looked up and asked her mother a question like, "Isn't that right, Mommy?" A memory of Susan Nason suddenly just came back. Eileen recalled the look of betrayal in Susie's eyes just before the murder. Later, more fragments would return, until Eileen had a rich and detailed memory. She remembered her father sexually assaulting Susie in the back of a van. She remembered that Susie was struggling as she said, "No, don't" and "Stop." She remembered her father saying "Now Susie," and she even mimicked his precise intonation. Next, her memory took the three of them outside the van, where she saw her father with his hands raised above his head with a rock in them. She remembered screaming. She remembered walking back to where Susie lay, covered with blood, the silver ring on her finger smashed.

Eileen's memory report was believed by her therapist, by several members of her family, and by the San Mateo district attorney's office, which chose to prosecute her father. It was also believed by the jury, who convicted George Franklin, Sr., of the murder. The jury began its deliberations on November 29, 1990, and returned its verdict the next day. Impressed by Eileen's detailed and confident memory, they found her father guilty of murder in the first degree. (p. 518)

Loftus (1993) went on in her article to examine various questions—among them, how authentic recovered memories are. The idea that memories of traumatic events can be repressed—buried in the unconscious mind for long periods of time, even forever—is a tenet of psychoanalytic forms of therapy dating back to Sigmund Freud. But from a cognitive psychology perspective, the question is whether such **repressed memories** can be carefully described, documented, and explained.

Loftus (1993) and Lindsay and Read (1994) pointed to advice given in different self-help books, one of the best known being *The Courage to Heal* (Bass & Davis, 1988). That book encourages readers who are wondering whether they have ever been victims of childhood sexual abuse to look for the presence of various symptoms such as having low self-esteem, depression, self-destructive or suicidal thoughts, and sexual dysfunction. The problem, Lindsay and Read (1994) noted, is that these symptoms can also occur for people who have *not* been victims of abuse; the symptoms are just not specific enough to be diagnostic. In *The Courage to Heal*, Bass and Davis (1988) made a further very strong claim: "If you are unable to remember any specific instances [of abuse] like the ones mentioned above but still have a feeling that something abusive happened to you, it probably did" (p. 21) and "If you think you were abused and your life shows the symptoms, then you were" (p. 22). The book goes on to recommend that readers who are wondering about their past spend time exploring the possibility that they were abused. It offers techniques for recalling specific memories, such as using old family photographs and giving the imagination free reign, or using a recalled childhood event as a beginning point and then deliberately trying to remember abuse connected with that event.

We have seen earlier that there is plenty of room to doubt the absolute accuracy of people's autobiographical memories even when people seem very sure of them. Research on eyewitness memory has shown how receptive people can be to postevent suggestions. But is it possible for false "memories" of events that never happened to be somehow implanted? Loftus and Pickrell (1995; see also Loftus, 2000; Loftus & Ketcham, 1994) reported on a study that suggests just such a possibility.

In that study, 24 people served as the target research participants. Experimenters first interviewed relatives of each participant (who, to be included in the study, needed to be familiar with the participant's early childhood) and from the interviews generated three true events that had happened to the research participant when the latter was 4 to 6 years old. Relatives were instructed that these events were not to be "family folklore" or to be so traumatic that they would be effortlessly recalled. Relatives also provided details about shopping malls and favorite treats of the research participant when he or she was a 5-year-old.

From the interviews with relatives, experimenters then created false accounts of an event that had never actually happened, in which the target participant had allegedly become lost in a shopping mall at 5 years of age. Included in the accounts were details about the name of the mall that had been the closest one to the participant then as well as names of family members who plausibly might have accompanied the target participant on the alleged trip. Here is an example of a "false memory" created for a 20-year-old Vietnamese American woman:

> You, your mom, Tien, and Tuan all went to the Bremerton K-Mart. You must have been 5 years old at the time. Your mom gave each of you some money to get a blueberry Icee. You ran ahead to get into the line first, and somehow lost your way in the store. Tien found you crying to an elderly Chinese woman. You three then went together to get an Icee. (Loftus & Pickrell, 1995, p. 721)

Participants were given booklets containing instructions and four stories. Three of the stories recounted actual events, and the fourth story recounted the false event. Each event was described in about a paragraph, with room left for the participants to describe their own recall of the event. Next, 1 to 2 weeks later, the participants were individually interviewed about their recollections (again being asked to recall as much as they could about the four events); the participants were reinterviewed about 2 weeks after that.

As a group, research participants recalled 68% of the true events. However, when completing the booklets, 29% of the participants (7 of 24) "recalled" the false event of being lost in a shopping mall. One of these 7 later said she did not recall the false memory at the first interview, but the rest (6, or 25%) maintained at least partial recall of the false event through both interviews. Participants' length of recall (measured in number of words they used to describe events) was higher for the true memories than for the false memories, and participants rated the clarity of their memories as lower for the false memories than for the true memories.

Loftus and Pickrell (1995) made no explicit claims about how easy it is to induce false memories or about how prevalent such memories are. They took the results as proof that false memories *can* be formed through suggestive questioning, and they offered a speculative account of the mechanism(s) responsible:

> The development of the false memory of being lost may evolve first as the mere suggestion of being lost leaves a memory trace in the brain. Even if the information is originally tagged as a suggestion rather than a historic fact, that suggestion can become linked to other knowledge about being lost (stories of others) as time passes and the tag that indicates that being lost in the mall was merely a suggestion slowly deteriorates. The memory of a real event, visiting a mall, becomes confounded with the suggestion that you were once lost in a mall. Finally, when asked whether you

were ever lost in a mall, your brain activates images of malls and those of being lost. The resulting memory can even be embellished with snippets from actual events, such as people once seen in a mall. Now you "remember" being lost in a mall as a child. By this mechanism, the memory errors occur because grains of experienced events or imagined events are integrated with inferences and other elaborations that go beyond direct experience. (p. 724)

Other researchers have also been able to induce "recollections" of events that never happened. Hyman, Husband, and Billings (1995), for instance, were able to induce about 25% of their undergraduate participants to falsely "recall" different childhood events: being hospitalized for an ear infection; having a fifth birthday party with pizza and a clown; spilling punch at a wedding reception; being in the grocery store when sprinklers went off; and being left in a parked car, releasing the parking brake, and having the car roll into something. Garry and Wade (2005) induced false memories with both narratives and (doctored) photographs, finding that the narratives were more effective in inducing false memories.

Clancy, Schacter, McNally, and Pitman (2000) reported a study in which a laboratory-based model of a false memory was induced. They made use of what is called the Deese/Roediger–McDermott paradigm, in which a participant is presented with a number of related words—for example, *nap*, *bed*, *quiet*, *dark*, *snore*, *dream*, *pillow*, and *night*. Later, the person is given a recognition test consisting of both these "old" words and some "new" ones that weren't on the list. Results show that semantically related words, such as *sleep*, are likely to be falsely recognized by up to about 80% of college student participants (Roediger & McDermott, 1995).

Clancy et al. (2000) recruited four groups: a control group of women who had never experienced childhood sexual abuse (CSA), a group of women who had experienced CSA and had a continuous memory of it, a group of women who believed they had experienced CSA but had no specific memory of it (the "repressed memory" group), and a group of women who claimed to have repressed and then recovered memories of experienced CSA (the "recovered memory" group). The recovered memory group showed much higher false recognition of the semantically related words than did all other groups. The authors concluded that, although great caution must be taken in interpreting the results, the findings are at least consistent with the hypothesis that women who report recovered memories are more likely to experience false recognition of words than women who do not report recovered memories.

Not all cognitive psychologists have received the research just described on false memories with complete enthusiasm, however. Pezdek (1994), for example, argued that just because an explanation exists for how false memories *could* be formed does not mean that false memories, especially for ones as traumatic as childhood abuse, actually *are* formed in this way. By analogy, Pezdek noted that an aeronautical engineering explanation exists for why it is impossible for bumblebees to fly (even though they obviously do). Pezdek cautioned against assuming that "memory recovery therapy" is very widespread and argued that existing evidence for therapist-implanted memories is quite weak.

Obviously, much more work needs to be done on the issue of whether, how, and when false information can be made a part of one's memory. Loftus and Pickrell's (1995) and Hyman et al.'s (1995) work is suggestive and provocative, but the question of to what degree it can be generalized remains open. A functional magnetic resonance imaging study (Cabeza, Rao, Wagner, Mayer, & Schacter, 2001) shows that different areas of

the brain become activated in a word recognition task, with "false" words (ones that were not presented but are semantically related to the "true" words that were actually presented) activating different regions of the brain.

Nonetheless, the extension of findings from word recognition tasks to real-world narrative memory recalls might not be straightforward. Lane, Ryan, Nadel, and Greenberg (2015) presented an overview of the way traumatic memories are healed in therapeutic work, arguing for a process of reconsolidation of the original memories together with healthier emotional experiences. Their proposal draws many supporters as well as critics.

But in any event, it is becoming clearer to cognitive psychologists that autobiographical memories do not function the way video cameras do, faithfully recording details and preserving them for long-term storage and later review. Instead, human memories are malleable and open to "shaping" by later questioning or information. Just how often such shaping occurs, and by what mechanisms, remains open with exciting questions with important real-world implications and consequences.

MEMORY CONSOLIDATION AND RECONSOLIDATION

In Chapter 6, we talked very briefly about the topic of memory consolidation, the idea that memories take some amount of time to become solidified and integrated. For several decades, psychologist James McGaugh has investigated the neurological underpinnings of this process—that is, the brain changes that comprise the process of memory consolidation (McGaugh, 2015).

McGaugh's research began with investigations of the effect of stimulant drugs (such as amphetamine) on the ability of rats to learn a maze. It turned out that a low dose given every day before each learning trial led to fewer errors in maze learning compared with the performance of rats given a dose of saline solution. Later work showed these drugs were even more effective if administered just after a learning trial. Still later work suggested similar kinds of effects with humans; immediate administration of substances such as caffeine seemed to lead to better memory, and disruption of normal brain functioning immediately after learning new material (say, by the administration of electroconvulsive shock) tended to disrupt memory.

Subsequent investigations began to implicate the role of the amygdala and the hippocampus, brain structures shown in Figure 2.2 of Chapter 2, in memory consolidation. Magnetic resonance imaging studies have shown greater activation of hippocampal regions of the human brain during learning, and the more activation at the time of learning, the stronger the odds of retrieving the learned material (B. Garrett, 2015). With emotion-provoking stimuli, the idea is that the activation of the amygdala modulates the storage of long-term memories (McGaugh, Cahill, & Roozendaal, 1996).

Lane et al. (2015) built on some of McGaugh's ideas about consolidation and memory to explore ways psychotherapy techniques can be used to help individuals with traumatic experiences recover. They argued that many successful therapies involve three components:

1. reactivating old [presumably traumatic] memories;
2. engaging in new emotional experiences that are incorporated into these reactivated memories via the process of reconsolidation; and

3. reinforcing the integrated memory structure by practicing a new way of behaving and experiencing the world in a variety of contexts. (p. 1)

Essentially, the authors argued that during the course of therapy, traumatic memories are recalled along with their original emotional responses. However, because these recollections are occurring in a therapeutic context, there is an opportunity of "correcting" the interpretation of events, which leads to different emotional responses and interpretations of the original event(s). Then, the reactivated memory (or memories) becomes reconsolidated together with the new emotional responses. Put succinctly, revisions to the original memory are made and stored. The authors posited

> that change in psychotherapy is not simply a result of a new memory being formed or new semantic structures being developed. Instead, reconsolidation leads to the transformation of all the components of the memory structure, including the original event memory. By this view, psychotherapy is a process that not only provides new experiences and ways to evaluate new experiences, but also changes rules and schemes derived from past experiences to fundamental ways through the reconsolidation of memory and its related cognitive structures. (p. 3)

In short, this proposal for **memory reconsolidation** incorporates aspects of Bartlett's ideas of memory reconstruction over time. Lane et al. are suggesting that the very malleability of memory can be harnessed to help individuals cope with traumatic episodes that occurred earlier in their lives. Of course, the proposal is not without critics (e.g., Brewin, 2015; Llewellyn, 2015; Patihis, 2015), but it is nevertheless very intriguing, and it will be interesting to see how future research assesses and enriches the general idea.

CHAPTER 7

Summary

1. The work reported here on people's recall of their own life events dovetails in several ways with the laboratory-based investigations of memory described in the last two chapters. Some of the findings that have emerged—for example, the constructive nature of recall—fit well with laboratory findings.
2. Autobiographical recall seems to be better than recall of laboratory stimuli, but whether different cognitive mechanisms are at work remains an open question.
3. Work on flashbulb and eyewitness memories suggests that people's recollections of moments of their past can be wrong even when those people seem absolutely convinced of the accuracy of their memories.
4. Flashbulb memories are recollections of one's personal circumstances at the time of hearing of an important and unexpected event. They differ from event memories, which are recollections of the event itself.
5. Although people are typically highly confident of their own flashbulb memories in particular, research suggests that these memories are also subject to forgetting and distortion. This in turn suggests that our own confidence in our memories may sometimes be too high; at the very least, there are probably occasions when we are both very sure of our memories and also very wrong.
6. Work on eyewitness testimony suggests that memory traces of a witnessed event are highly malleable and subject to disruption by postevent leading questions.
7. Debates over whether memory traces can be repressed for long periods of time and then recalled have erupted during recent years. Some studies purport to show that under repeated urgings, people can be induced to "recall" emotional events that never happened. One study suggests there may well be limits to the types of "false" memories that can be so implanted, but as yet we do not have a firm understanding of what these limits are.
8. Memories when first formed are in a fragile state until they undergo a process of consolidation. Brain structures such as the hippocampus and the amygdala are thought to play a role in this process.
9. Research into the process of memory consolidation—the solidification of memory traces that occurs during the period just after first acquiring a memory trace—has been shown to involve areas of the brain including the hippocampus and, in the case of emotional memories, the amygdala.
10. A proposal for the use of memory reconsolidation in psychotherapy builds on the idea that one's traumatic memories are, like other memories, malleable and subject to reinterpretation.

Review Questions

1. Describe Bartlett's approach to the study of memory, and contrast it with that of Ebbinghaus.
2. Describe Bartlett's methods and findings, and explain what they suggest about the nature of memory.
3. How have researchers such as Linton and Brewer studied autobiographical memory? What are the strengths and weaknesses of each approach?
4. What do the findings of Linton and Brewer suggest about the workings of autobiographical memory for ordinary events?
5. What is infantile (or childhood) amnesia, and how might this phenomenon be explained?
6. Distinguish between flashbulb and event memories.

7. Is there a need to posit special mechanisms for flashbulb memories? Defend your view.
8. Describe Bransford's work on people's recall of sentences and how it relates to work on eyewitness memory.
9. Describe the debate over "recovered" versus "false" memories of traumatic events. What are the most important issues for cognitive psychologists to address, and what issues (pragmatic, ethical, and theoretical) are they likely to face in doing so?
10. How does the proposal of Lane et al. for memory reconsolidation in therapy build off of Bartlett's work on narrative memory?

Key Terms

autobiographical memory
childhood amnesia
event memory
eyewitness memory
false memory
flashbulb memory
infantile amnesia
memory reconsolidation
method of serial reproduction
recovered memory
repressed memory
schemata

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Setting the Stage	Memory Distortion
	Recovered Memory
Autobiographical Memory	Involuntary Autobiographical Memories
	Why Eyewitnesses Get It Wrong
	The Gift of Endless Memory
The Recovered/False Memory Debate	Sleep Deprivation and False Memories
	Recovered Memories, False Confessions, and the Misinformation Effect
Memory Consolidation and Reconsolidation	Sleep's Role in Memories