

One of the environmental psychologists who led in applying Tolman's ideas to humans was Lynch (1960). Lynch proposed five categories of environmental features that we make use of in forming our cognitive maps. *Paths* are perceived arteries that carry traffic, whether it be in cars, on foot, on bicycles, or in boats. *Edges* are boundaries we use in our cognitive mapping to divide one area from another, but they do not function as paths, such as a canyon, a wall, or the shore of a lake. *Nodes* are focal points, such as city parks, traffic circles, or a fountain, where paths or edges meet. *Districts* take up large spaces on our mental representations and are defined by some common characteristic, such as the theater district or restaurant row. *Landmarks* are structures that are used as points of reference within a map and are usually visible from a distance, such as a clock tower, a church steeple, or a tall or especially unusual building.

This early article by Tolman articulating his theory of cognitive mapping has been cited throughout the 50 years since its publication consistently and frequently in a wide array of diverse studies. For example, a recent study applied Tolman's model of cognitive maps to understanding how birds rely on the location of the sun to find landmarks and create cognitive maps for their remarkable migratory treks over hundreds or even thousands of miles each year (Bingman & Able, 2002). On a different track, a study from the field of tourism cited Tolman's ideas in an examination of how travelers in wilderness areas (*nature-based tourists*) develop their knowledge of the terrain they are exploring (Young, 1999). The author found that several factors influenced the quality of the participants' mental maps, including mode of transportation, whether they had visited the region before, number of days spent in the area, where they were from, their age, and their gender.

Today, much of our "traveling" does not require going anywhere at all, at least in a physical sense. We can now find our way to anywhere in the world on the Internet. Tolman's conceptualization of cognitive maps has even influenced research on the psychology of the World Wide Web. Imagine for a moment what you do when you are on the Internet: you explore; you jump from place to place; you surf; you navigate, you google. You don't really go anywhere geographically, yet you often feel as if you have been on a journey. And chances are, most of you could probably go there again using approximately the same route, right? If so, you have formed a mental map of a small part of the Web. A study in a journal devoted to research on human-computer relationships examined Internet search behavior and the strategies people use to navigate the Web (Hodkinson et al., 2000). The researchers were able to translate Web search behavior into graphic form, identify individual search strategies, and suggest possible methods for improving Internet search effectiveness.

Tolman's research was incorporated into a study that may have shed some light on that age-old gender stereotype: "Men never ask for directions." Research by Bell and Saucier (2004) explored the connection between people's gender and sex hormone levels with their ability to navigate along a specified

route. Imagine for a moment that you are moving along a path from point A to point B. Along the way, you will pick up some mental images of your surroundings, such as notable landmarks in the distance and specific points of interest along your route, and you will probably have a general sense of the direction from which you began your journey. If asked to point to some of these mental representations, you would likely indicate the correct direction for some, but not for others. In other words, you would have developed a cognitive map of your route, but it would seldom be perfect. Bell and Saucier asked participants to do just this and found that greater levels of testosterone, the primary male sex hormone, was significantly related to increased accuracy in these pointing tasks, indicating a clearer understanding of the cognitive maps the participants formed during their environmental experiences. So, does this mean that men ask for directions less than women do because men already know where they are? No. As intriguing as these findings are, a great deal more research will be needed to answer *that* one!

Bell, S., & Saucier, D. (2004). Relationship among environmental pointing accuracy, mental rotation, sex, and hormones. *Environment and Behavior*, 36(2), 251-275.

Bingman, V., & Able, K. (2002). Maps in birds: Representational mechanisms and neural bases. *Current Opinion in Neurobiology*, 12, 745-750.

Hodkinson, C., Kiehl, G., & McColl-Kennedy, J. (2000). Consumer Web search behavior: Diagrammatic illustration of wayfinding on the Web. *International Journal of Human-Computer Studies*, 52(5), 805-830.

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Young, M. (1999). Cognitive maps of nature-based tourists. *Annals of Tourism Research*, 26(4), 817-839.

Reading 16: THANKS FOR THE MEMORIES!

Loftus, E. F. (1975). Leading questions and the eyewitness report. *Cognitive Psychology*, 7, 560-572.

PERRY MASON: Hamilton, I believe that my client is telling the truth when she says she was nowhere near the scene of the crime.

HAMILTON BURGER: Perry, why don't we let the jury decide?

PERRY MASON: Because, Hamilton, I don't believe there is going to be a trial. You haven't got a case. All you have is circumstantial evidence.

HAMILTON BURGER: Well, Perry, I suppose this is as good a time as any to tell you. We have someone who saw the whole thing, Perry. We have an *eyewitness!*

And, as the mysterious music rises in a crescendo, we know that this is going to be another difficult case for the most victorious TV lawyer of all time, Perry Mason. Even though we are reasonably certain Mason will prevail in the end, the presence of a single eyewitness to the crime has seemingly changed a weak

case into a nearly airtight one for the district attorney. Why do people believe that eyewitness reports provide such strong evidence in criminal cases? The reason is that we tend to believe that the way in which a person remembers an event must be the way it actually happened. In other words, memory is typically thought of as the *replaying* of an event, exactly as we saw it, like playing a video or DVD. However, psychologists who study memory have drawn that notion into question, along with many other common beliefs about the reliability of human memory.

One of the leading researchers in the area of memory is Elizabeth Loftus at the University of Washington. She has found that when an event is recalled, it is not accurately re-created. Instead, what is recalled is a *reconstruction* of the actual event. Loftus's research has demonstrated that reconstructive memory is a result of our use of new and existing information to fill in the gaps in our recall of an experience. She maintains that memories are not stable, as we commonly believe, but that they are malleable and changeable over time. If you tell someone a story from your vacation 5 years ago, you *think* you are re-creating the experience just as it happened, but you probably are not. Instead, you have reconstructed the memory using information from many sources, such as the previous times you've told it, other experiences from the same or later vacations, perhaps a movie you saw last year that was shot in a place similar to your vacation, and so on. You know this is true if you and a person who was with you at the time have ever recounted your shared experience. You are often surprised by how your stories can totally disagree about an event you both experienced simultaneously!

Usually, these alterations in memory are nothing more than interesting and harmless. However, in legal proceedings, when a defendant's fate may rest on the testimony of an eyewitness, memory reconstructions can be critical. For this reason, much of Loftus's research in the area of memory has been connected to legal eyewitness testimony. In her early research, she found that very subtle influences in how a question is worded can alter a person's memory for an event. For example, if witnesses to an automobile accident are asked "Did you see a broken headlight?" or "Did you see the broken headlight?" the question using the word *the* produced more "yes" responses than the question using the word *a*, even when no headlight had been broken. The use of *the* presupposes (assumes) the presence of a broken headlight, and this, in turn, causes many witnesses to add one to their memories as they reconstruct the event.

The article by Loftus that is the focus of this discussion is one of the most often cited because it reports on four related studies that took her theory a major step forward. In these studies, she demonstrated that the mere wording of questions asked of eyewitnesses could alter their memories of events when they were later asked other questions about the events. This research influenced both memory theory and criminal law.

THEORETICAL PROPOSITIONS

These studies focus on the power of questions containing presuppositions to alter a person's memory of an event. Loftus defines a presupposition as a condition that must be true for the question to make sense. For example, suppose

you have witnessed an automobile accident and I ask you "How many people were in the car that was speeding?" The question *presupposes* that the car was speeding. But what if the car was not actually speeding? You might answer the question anyway because it was not a question about the speed of the car—it was about its passengers. Loftus proposed, however, that because of the way the question was worded, you might add the speeding information to your memory of the event. Consequently, if you are asked other questions later, you will be more likely to say the car was speeding. Loftus hypothesized that if eyewitnesses are asked questions that contain a false presupposition about the witnessed event, the new *false* information may be incorporated into the witness's memory of the event and appear subsequently in new testimony by the witness.

METHOD AND RESULTS

The methods and results for each of the four experiments reports are summarized in the following subsections.

Experiment 1

In the first study, 150 participants in small groups saw a film of a five-car chain-reaction accident that occurred when a driver ran through a stop sign into oncoming traffic. The accident took only 4 seconds and the entire film ran less than a minute. After the film, the participants were given a questionnaire containing 10 questions. For half of the participants, the first question was "How fast was Car A [the car that ran the stop sign] going when it ran the stop sign?" For the other half of the participants, the question was "How fast was Car A going when it turned right?" The remaining questions were of little interest to the researchers until the last one, which was the same for both groups: "Did you see a stop sign for Car A?"

In the group that had been asked about the stop sign, 40 participants (53%) said they saw a stop sign for Car A, while only 26 (35%) in the "turned-right" group claimed to have seen it. This difference was statistically significant.

Experiment 2

The second study Loftus reported was the first in this series to involve a delayed memory test and was the only one of the four not to use an automobile accident as the witnessed event. For this study, 40 participants were shown a 3-minute segment from the film *Diary of a Student Revolution*. The clip showed a class being disrupted by eight antiwar demonstrators. After they viewed the film, the participants were given questionnaires containing 20 questions relating to the film clip. Half of the participants were asked "Was the leader of the four demonstrators who entered the classroom a male?" The other half were asked "Was the leader of the *twelve* demonstrators who entered the classroom a male?" All remaining questions were identical for the two groups.

One week after this initial test, the participants from both groups returned and answered 20 new questions about the film (without seeing it

again). The one question that provided the results of the study was "How many demonstrators did you see entering the classroom?" Remember, both groups of participants saw the same film and answered the same questions, except for the reference to 12 versus 4 demonstrators.

The group that had received the question presupposing 12 demonstrators reported seeing an average of 8.85. Those who had received the question asking about 4 demonstrators averaged 6.40. This was also a significant difference. This experiment showed that, on average, the wording of one question altered the way participants remembered the basic characteristics of a witnessed event.

Experiment 3

This third experiment was designed to see if a false presupposition inherent in a question could cause witnesses to reconstruct their memory of an event to include objects that, in reality, were not there. The participants (150 university students) watched a short video of an accident involving a white sports car and then answered 10 questions about the content of the video. One question included for only half the participants was "How fast was the white sports car going when it passed the barn while traveling along the country road?" The other half of the participants were asked "How fast was the white sports car going while traveling along the country road?" As in the previous study, the participants returned a week later and answered 10 new questions about the accident. The question under study was "Did you see a barn?"

Of those participants who had previously answered a question in which a barn was mentioned, 13 (17.3%) of them answered "yes" to the test question, compared with only 2 (2.7%) in the no-barn group. Once again, this was a statistically significant difference.

Experiment 4

The final experiment reported in this article was somewhat more elaborately designed to meet two goals. First, Loftus wanted to further demonstrate the memory reconstruction effects found in Experiment 3. Second, she wondered if perhaps just the mention of an object, even if it was not included as part of a false presupposition, might be enough to cause the object to be added to memory. For example, imagine you are asked directly "Did you see a barn?" when no barn was depicted in the film. You will probably answer "no." But if you are asked again a week later, might that barn have crept into your memory of the event? This is what Loftus tested in the fourth experiment.

Three groups of 50 participants viewed a 3-minute film shot from the inside of a car that ends with the car colliding with a baby carriage pushed by a man. The three groups then received booklets containing questions about the film. These booklets differed as follows:

Group D: The direct question group received booklets containing 40 "filler" questions and 5 key questions directly asking about

TABLE 16-1 Appearance of Nonexistent Objects in Participants' Recall of Filmed Accident Following Direct Questions and False Presuppositions

DIRECT QUESTION	FALSE PRESUPPOSITION	PERCENT OF "YES" RESPONSES TO DIRECT QUESTION 1 WEEK LATER BY GROUP	
		D	F
Did you see a school bus in the film?	Did you see the children getting on the school bus?	12	6
Did you see a truck in the beginning of the film?	At the beginning of the film, was the truck parked beside the car?	8	0
Did you see a center line on the country road?	Did another car cross the center line on the country road?	14	8
Did you see a woman pushing the carriage?	Did the woman pushing the carriage cross into the road?	36	26
Did you see a barn in the film?	Did you see a station wagon parked in front of the barn?	8	2

C = control group

D = direct-question group

F = false-presupposition group
(From p. 568.)

nonexistent objects—for example, "Did you see a barn in the film?" (see Table 16-1).

Group F: The false presupposition group received the same 40 filler questions and 5 key questions that contained presuppositions about the same nonexistent objects, such as, "Did you see a station wagon parked in front of the barn?"

Group C: The control group received only the 40 filler questions.

One week later all the participants returned and answered 20 new questions about the film. Of the questions, 5 were the exact same key questions as were asked of the direct-question group a week before. So, group D saw those 5 questions twice. The dependent measure (the result) was the percentage of participants in each group who claimed to remember the nonexistent objects.

Table 16-1 summarizes the findings for all three groups. Remember, the film included no school bus, truck, center line on the road, woman pushing the carriage, or barn. Combining all the questions, the overall percentages of those participants answering "yes" to the direct questions 1 week later were 29.2% for the false-presupposition group, 15.6% for the direct-question group, and 8.4% for the control group. The differences between the direct-question group and the false-presupposition group for each item, as well as for all the items combined, were statistically significant.

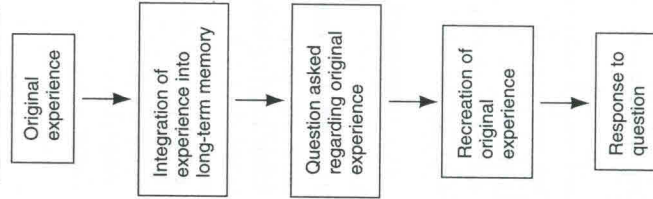
DISCUSSION

Based on these and other studies, Loftus argued that an accurate theory of memory and recall must include a process of reconstruction when new information is integrated into the original memory of an event. The findings of these studies cannot be explained by assuming that recall simply involves a mental replaying of an event, even with varying degrees of accuracy. To illustrate, Figure 16-1 compares the traditional view of recall with the reformulated process proposed by Loftus. As you can see, the extra step of integrating new information into memory has been added. This new information, in turn, causes your representation of the original memory to be altered or *reconstructed*. Later, if you are asked a question about the event, your recall will not be of the actual original event but, rather, your reconstruction of it. Loftus contended that this reconstruction process was the reason that barns, school buses, trucks, women pushing baby carriages, and center lines in roads were all conjured up in participants' memories when they were not part of the original experience. The false presupposition in the questions provided new in-

formation that was unintentionally integrated into the participants' memories of the event.

Applying this idea to eyewitnesses in criminal investigations, Loftus pointed out that witnesses to a crime are often questioned more than once. They might be asked questions by police at the scene of the crime, interviewed by the prosecuting attorney assigned to the case, and again questioned in court. During these various question-and-answer sessions, it is not unlikely that false presuppositions will be made, possibly unintentionally, in numerous ways. Common, innocent-sounding questions such as "What did the guy's gun look like?" or "Where was the getaway car parked?" have been shown to increase the chances that witnesses will remember a gun or a getaway car whether or not those items were actually there (Smith & Ellsworth, 1987). Although the attorneys, the judge, and the jury are making the assumption that the witness is re-creating what was actually seen, Loftus contends that what is being remembered by the witness is a "regenerated image based on the altered memorial representation" (p. 571).

TRADITIONAL VIEW



LOFTUS THEORY

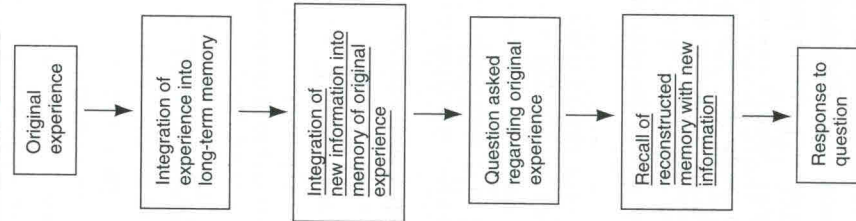


FIGURE 16-1 Recall of an event in response to a question.

RECENT APPLICATIONS

Several studies represent the ongoing influence of Loftus's impressive body of work on eyewitness testimony. One study citing her 1975 article examined how lawyers' complicated questions negatively affect eyewitness accuracy and confidence (Kebbell & Giles, 2000). All participants watched identical videotaped events and were questioned a week later about what they saw. Half the participants were asked questions in confusing language (you know, that lawyer-speak of "Is it not true that . . . ?"), while others were asked the same questions in simple language. The results were clear: the participants receiving the confusing form of the questions were less accurate in their eyewitness reports and were also less confident of their answers than those in the straightforward-question condition. Other research has demonstrated that when eyewitnesses are shown more than one photographic lineup of criminal suspects (a common event in law enforcement), their accuracy in identifying the correct perpetrator decreases significantly as they incorporate the newer faces into their reconstruction of the original event (Pezdek & Blandon-Gitlin, 2005).

Another intriguing study applied Loftus's work to reports of "fantastic memories," that is, memories that bear greater similarity to fantasy than reality, such as alien abductions, out-of-body experiences, extrasensory perception (ESP) events, encounters with ghosts, and so on (French, 2003). Clearly, if these reports of memories were true, they would provide proof that these paranormal occurrences are real. However, research tells us time and time again that such events have *never* been scientifically demonstrated. So, what accounts for the memories? The answer may lie in the fallibility and unreliability of human memory as discussed in this reading and, perhaps, the ability of our brains to *create* memories of events that never actually happened. As French points out, "A number of psychological variables that have been

shown to correlate with susceptibility to false memories (e.g., hypnotic susceptibility, tendency to dissociate, etc.) also correlate with the tendency to report paranormal experiences" (French, p. 153).

In addition to her ongoing work in the area of eyewitness testimony, Elizabeth Loftus is currently one of the leading experts in the heated controversy over repressed childhood memories. On one side of this debate are those people who claim to have been abused sexually sometime in their past but who have only recently, often with the help of a therapist, remembered the abuse. The usual explanation for the sudden recall of these victims assumes that the traumatic memories have been repressed in the unconscious and have only recently been revealed. On the other side are those who are suddenly accused of the abuse but who categorically deny it and claim that these memories are pure fantasy or have been somehow implanted during therapy (see Garry & Loftus, 1994, for a review of this controversy). This falls squarely into the area of Loftus's memory research.

Loftus's book *The Myth of Repressed Memories: False Memories and Allegations of Sexual Abuse* (Loftus & Ketcham, 1994) summarized her findings in this area and combined them into a cohesive argument. Loftus contends, and appears to have demonstrated in numerous studies, that repressed memories simply do not exist. In fact, she is at the forefront of psychologists who question the entire notion and existence of an unconscious. A main feature of Loftus's argument is that experimental evidence repeatedly demonstrates that especially traumatic memories tend to be the ones we remember *best*. And yet, clinicians often report these instances of repressed memories of sexual abuse that rise to the surface during specific and intense forms of therapy. How can these two seemingly opposing views be reconciled? Loftus suggests three possible memory distortions that might explain what clinicians see as repression (Loftus, Joslyn, & Polage, 1998). First, early sexual abuse may simply be forgotten, not repressed. She cites research demonstrating that when children do not understand the sexual nature of an abusive event, it tends to be remembered poorly. Second, it is possible that people in therapy *say* they had no memory of a traumatic event, but, in reality, they never actually forgot it. Avoiding thinking about something is different than forgetting it. And third, Loftus contends that some "people may believe that a particular traumatic event occurred and was repressed when, in fact, it did not happen in the first place. Under some circumstances, some combination of these distortions could lead to situations that are interpreted as repression" (p. 781).

You can imagine that Loftus's position on repressed and recovered memories is not without critics (e.g., Spitzer & Avis, 2006; Steinberg, 2000). After all, her rejection of the power of repression is opposed to commonly held beliefs about psychology and psychotherapy that have been around since Freud. Moreover, many therapists and victims have a very personal stake in their belief that memories of abuse can be repressed for years and later recovered. However, a careful reading of Loftus's thorough and careful scientific work should cause anyone to question this belief.

CONCLUSION

Elizabeth Loftus is considered by most to be the leading researcher in the areas of memory reconstruction and eyewitness inaccuracy. Her research in these areas continues. Her findings over the years have held up quite well to challenges and have been supported by other researchers in the field.

Little doubt exists within the psychological and legal professions today that eyewitness reports are subject to many sources of error such as postevent information integration. Because of the body of research by Loftus and others, the power and reliability of eyewitnesses in judicial proceedings are now justifiably questioned. Loftus has been one of the most sought-after expert witnesses (usually for the defense) to demonstrate to juries the care they must use when evaluating the testimony of eyewitnesses.

As Loftus herself summarizes in her 1994 book, "I study memory and I am a skeptic" (Loftus & Ketcham, 1994, p. 7). Perhaps we all should be.

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