"EYEWITNESS TESTIMONY" INFO. DR. ELIZABETH LOFTHUS.

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Eyewitness testimony:

Does the malleable human memory interfere with legal justice?

> Human memory is not a photographic recollection of events. It is a collection of information from many sources. Sometimes an eyewitness cannot tell if the information 'remembered' was actually observed.

The Heidi Peterson kidnapping was one of the most tragic events to hit the city of Seattle last year. Heidi, you recall, was the four-year old girl who vanished in February, 1974, from her home on North Capitol Hill. She was never again to be seen alive.

While the search for Heidi continued in Seattle, a similar case was being investigated in Cincinnati, Ohio. There, during the month of September, four-year old Allison Mechem, daughter of the chairman of Taft Broadcasting Co., was abducted from in front of her home late one Monday afternoon while she was playing with a neighbor. The difference with the Allison Mechem case was that the day after her abduction, a suspect, Frank Wiechman, was arrested, and after being identified by four separate witnesses, he was charged with the kidnapping. Wiechman spent almost a week in jail, with the charge of kidnapping hanging over his head, maintaining his innocence the entire time.

It turns out that Wiechman was completely innocent, but he was released only after the Cincinnati police subsequently found evidence that the actual kidnapper was Clifford J. Kroger. Wiechman's only "crime" was that he looked like Kroger, and for this he spent nearly a week in jail.

This is far from a rare, isolated case of mistaken identification; we know there are others, but, unfortunately for those who may still be languishing in jail, we do not know how many.

—In November, 1972, a 17-year old college freshman, Lawrence Berson was arrested and held on $60,000 bail on multiple rape charges in Queens, New York. He was released only after the arrest of a 20-year old Bronx "gypsy cab" driver who looks strikingly like Berson. Five women victims had mistakenly identified Berson as their attacker.

—In June, 1972, 43-year old Frank J. Doto was arrested in connection with a supermarket robbery in California in which a policeman was shot in the head. Seventeen witnesses identified Doto, who maintained he was in another city at the time of the holdup. His story checked out.

—In early 1973, Assistant District Attorney William Schrager was arrested in connection with a series of sexual assaults. He was put into a number of lineups, usually with policemen who were taller and heavier than he. To his horror, he was identified by four different women. Schrager was later released when a similar looking postman (who is the same height but 40 pounds heavier than Schrager) confessed to some of the crimes.

—In October, 1971, a 34-year old Chicano, Ruben Garcia, was arrested and charged with the armed robbery of a restaurant-bar in California. Three people identified Garcia, one of whom was a police detective who happened to be eating at the restaurant on the night of the robbery. Garcia spent at least three months in the county jail, and probably would have been there longer had another man not confessed to the crime.

—Gregory Boyd was ordered to stand trial after two gas station attendants identified him as the man who held them up. Boyd, who simply could not remember where he was on the night of the robbery, spent nearly a month in a Detroit county jail until his trial began. While on the stand, Boyd remembered, and he announced that he had been in jail on the date of the hold up. Probably no better alibi exists; the case was promptly dismissed.

These examples show that one witness, two witnesses, three, five or even 17 witnesses . . . all can be wrong. A night in jail, a week, a month or three months . . . all are pretty horrible, particularly when forced on an innocent man.

Despite the numerous documented instances of poor performance on the part of eyewitnesses to a crime, they continue to play a significant role in the courtroom, wielding considerable influence over the decision of the jury. In one study, a criminal trial was simulated, using 150 UW undergraduates as jurors. The students received a written description of a robbery in which two people were killed. The student-jurors also received a summary of the evidence and arguments presented at the defendant's trial, and based on the evidence each juror arrived at a verdict of guilty or not guilty.

Jurors who were told that there had been no eyewitnesses to the crime were likely to reach guilty verdicts 18 per cent of the time. Other jurors who were told that a single eyewitness testified that he saw the defendant shoot the two victims voted for conviction 72 per cent of the time. A third group was told that an eyewitness had testified to seeing the shootings, but that the defense attorney had discredited him. The attorney claimed that the eyewitness had not been wearing his glasses at the time of the robbery, and since he had vision poorer than 20-400 he could not possibly have seen the face of the robber from where he stood. Even though the eyewitness had been discredited, the jurors in this group voted for conviction 68 per cent of the time.

Of course, these percentages would not apply to all criminal cases. The facts used in the Washington experiment were selected to present jurors with a case that did not point strongly to guilt (with no eyewitness, only 18 per cent voted guilty). Yet, the introduction of a single eyewitness, whether that witness was discredited or not, changed the case into one which did point strongly to guilt.

Because eyewitness testimony carries so much weight with a typical juror, it is enormously important to find our more about that type of evidence, and particularly to discover what goes on in a witness's mind when he is attempting to report accurately but does not. As a first step toward an answer, we must consider the nature of human memory.

There are now many experiments in literature that demonstrate that when we see something, whether it be simple like a list of words or complex like a crime, we do not simply store a "photographic image" of that event in memory and then on some later occasion retrieve the memory intact. Human memory is not a mirror of our experience. Rather, at the time we want to answer a question about an event, we reconstruct the event, using information from many different sources. Some of the information comes from our original perception of the event, but some of the information is in the form or inferences drawn later, or new information supplied later, often long after the event has taken place. Over a period of time, the information from these different sources may integrate, so that a witness cannot really say how he knows a specific detail that he has retrieved from his memory. Sometimes new information received after the original experience can actually alter or distort a person's memory for that experience. Most people do not realize how malleable human memory is.

During the past two years, I have completed over ten experiments showing how information subsequent to an event can alter a person's memory for that event. In these experiments the new information is supplied rather subtly in the form of a "leading question." For example, in one study subject-witness were shown a film segment depicting a multiple-car accident. After the film, some of the subjects were asked "About how fast were the cars going when they hit each other?" whereas others were asked "About how fast were the cars going when they smashed into each other?" Witnesses who were queried with "smashed" gave higher estimates of speed than those who were queried with "hit." A week later the subjects returned and without viewing the accident again they answered more questions about it. This time, the critical question asked whether the witness had seen any broken glass (there was no broken glass in the film). If the original question with "smashed" says to the subject that the cars did indeed smash into each other, it might influence the subject to remember the accident as more severe than it had been. If the accident is more severe, the witness might also "remember" details (like broken glass) that were not shown but were commensurate with an accident occurring at high speed.

In fact, over twice as many subjects interrogated with "smashed" reported seeing the nonexistent glass as those interrogated with "hit." This finding is consistent with the description of human memory stated earlier, namely that new information can cause a change in a witness's memory for an event.

The malleability of human memory also has consequences for the recognition and identification of the perpetrator of a crime by a witness to that crime. Here too information supplied by an investigating officer (e.g., The robber was heavy, wasn't he? asked with a suspect in mind) can alter the witness's memory. Some-

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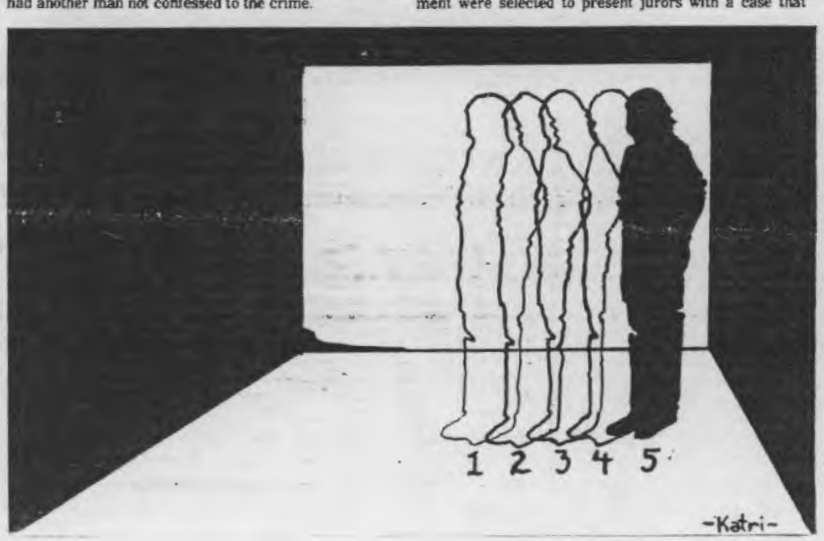

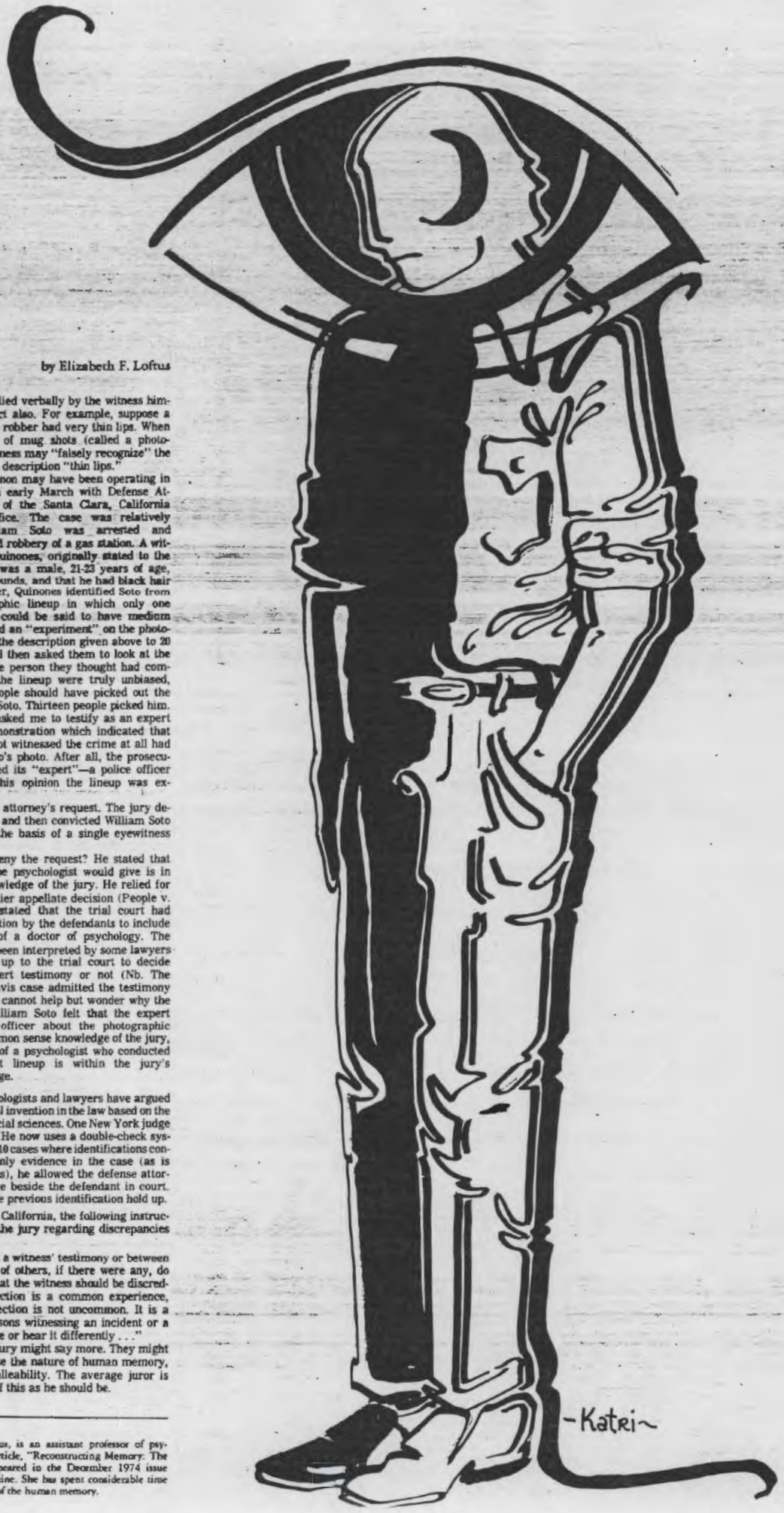

by Elizabeth F. Loftus

times information supplied verbally by the witness himself can have an impact also. For example, suppose a witness recalls that the robber had very thin lips. When later examining a set of mug shots (called a photographic lineup), the witness may "falsely recognize" the person who best fits the description "thin lips."

This sort of phenomenon may have been operating in a case I worked on in early March with Defense Attorney Mark Harmon of the Santa Clara, California Public Defender's Office. The case was relatively straightforward: William Soto was arrested and charged with the armed robbery of a gas station. A witness-victim, Richard Quinones, originally stated to the police that the robber was a male, 21-23 years of age, 5'7"-5'8" tall, 150-160 pounds, and that he had black hair of medium length. Later, Quinones identified Soto from a six-person photographic lineup in which only one person (possibly two) could be said to have medium length hair. I performed an "experiment" on the photographic lineup: I read the description given above to 20 people individually, and then asked them to look at the photos and pick out the person they thought had committed the crime. If the lineup were truly unbiased, about three to four people should have picked out the photograph of William Soto. Thirteen people picked him. The defense attorney asked me to testify as an expert witness about this demonstration which indicated that even people who had not witnessed the crime at all had a tendency to pick Soto's photo. After all, the prosecution had been permitted its "expert"—a police officer who testified that in his opinion the lineup was extremely fair.

The judge denied the attorney's request. The jury deliberated for six hours, and then convicted William Soto of armed robbery on the basis of a single eyewitness identification.

Why did the judge deny the request? He stated that the information that the psychologist would give is in the common sense knowledge of the jury. He relied for this decision on an earlier appellate decision (People v. Johnson, 1974) which stated that the trial court had properly rejected a motion by the defendants to include the expert testimony of a doctor of psychology. The appellate decision has been interpreted by some lawyers as meaning that it is up to the trial court to decide whether to admit expert testimony or not (Nb. The judge in the Angela Davis case admitted the testimony of a psychologist). One cannot help but wonder why the judge in People v. William Soto felt that the expert opinion of the police officer about the photographic lineup is not in the common sense knowledge of the jury, but the expert opinion of a psychologist who conducted experiments with that lineup is within the jury's common sense knowledge.

A number of psychologists and lawyers have argued the need for social invention in the law based on the findings of the social sciences. One New York judge has taken this to heart. He now uses a double-check system on eyewitnesses. In 10 cases where identifications constituted virtually the only evidence in the case (as is true in many rape cases), he allowed the defense attorneys to seat a look-alike beside the defendant in court. In only two cases did the previous identification hold up.

More can be done. In California, the following instruction has been given to the jury regarding discrepancies in testimony:

"... discrepancies in a witness' testimony or between his testimony and that of others, if there were any, do not necessarily mean that the witness should be discredited. Failure of recollection is a common experience, and innocent misrecollection is not uncommon. It is a fact, also, that two persons witnessing an incident or a transaction often will see or hear it differently ..."

The instructions to a jury might say more. They might more strongly emphasize the nature of human memory, and particularly its malleability. The average juror is probably not as aware of this as he should be.

The writer, Elizabeth Loftus, is an assistant professor of psychology at the UW. Her article, "Reconstructing Memory: The Incredible Eyewitness," appeared in the December 1974 issue of Psychology Today magazine. She has spent considerable time researching the weaknesses of the human memory.

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Degrees

B.A., with highest honors in Mathematics and Psychology
University of California, Los Angeles, 1966.

M.A., in Psychology
Stanford University, 1967.

Ph.D., in Psychology
Stanford University, 1970.

Honors and Awards

Phi Beta Kappa, elected 1965.

Pi Mu Epsilon, national mathematics honorary, elected 1965.

Mortar Board, national senior women's honorary, elected 1965.

Public Health Service Traineeship, Stanford University, 1966-1969.

National Institute of Mental Health, Fellowship #MH 46479, 1969-1970.

National Institute of Mental Health, Grant #MH 20280, 1971-1972.

National Institute of Mental Health, Grant #MH 22141, 1973-1974.

Department of Transportation, GRant #WA 11 0004, 1974-1975.

Who's Who of American Women, 1974.

Memberships and Professional Affiliations

Psi Chi, elected 1965.

Sigma Xi, joined 1968.

Psychonomic Society, joined 1971.

Psychometric Society, joined 1972.

American Psychological Association, joined 1973.

Eastern Psychological Association, joined 1973.

Washington State Psychological Association, joined 1973.

Western Psychological Association, joined 1974.

American Psychology-Law Society, joined 1974.

Teaching Experience

Assistant Professor, University of Washington, 1973-present.

Assistant Professor, New School for Social Research, Graduate Faculty, 1970-1973.

Graduate instructor in seminars on human learning and memory, thinking and problem solving, Stanford University, 1968-1969.

Teaching assistant in courses on General Psychology and Statistics, Stanford University, 1967-1969.

Other Professional Experience

Editorial Board: Journal of Experimental Psychology, 1974-

Guest Consulting Editor: Perception and Psychophysics
Cognitive Psychology
Memory and Cognition
Journal of Research in Personality
Psychological Review

National Science Foundation, Outside Reviewer, 1973-1974.

Research Associate with Patrick Suppes, Stanford University, Summer 1972.

Consultant for General Services Administration, United States Government, 1974-

Consultant for Audio Productions, Inc., New York, N. Y., 1972-1973.

Consultant and Reviewer for: Prentice-Hall Publishers, 1970-1971.
Harcourt Brace Javonovich, Inc., 1972.

Practicum, Counseling and Testing Center, Stanford University, 1968-1969.

Publications

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Fishman, E. J. (Loftus), Keller, L., & Atkinson, R. C. Massed vs. distributed practice in computerized spelling drills. Journal of Educational Psychology, 1968, 59, 290-296. Reprinted in Atkinson, R. C., and Wilson, H. A. (Eds.), Computer-assisted instruction: A book of readings. New York: Academic Press, 1969.

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Loftus, E. F. & Scheff, R. W. Categorization norms for fifty representative instances. Journal of Experimental Psychology Monograph, 1971, 91, 355-364.

Loftus, E. F. & Suppes, P. Structural variables that determine problem-solving difficulty in computer-assisted instruction. Journal of Educational Psychology, 1972, 63, 531-542.

Loftus, E. F. & Freedman, J. L. Effect of category-name frequency on the speed of naming an instance of the category. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 343-347.

Loftus, E. F. & Suppes, P. Structural variables that determine the speed of retrieving words from long-term memroy. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 770-777.

Loftus, E. F. Nouns, adjectives, and semantic memory. Journal of Experimental Psychology, 1972, 96, 213-215.

Loftus, E. F. Category dominance, instance dominance, and categorization time. Journal of Experimental Psychology, 1973, 97, 70-74.

Loftus, E. F. & Grober, E. H. Retrieval from semantic memory by young children. Developmental Psychology, 1973, 8, 310.

Loftus, E. F. Activation of semantic memory. American Journal of Psychology, 1973, 86, 331-337.

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Grober, E. H. & Loftus, E. F. Semantic memory: Searching for attributes versus searching for names. Memory and Cognition, 1974, 2, 413-416.

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Loftus, E. F. &. Cole, W. Retrieving attribute and name information from semantic memory. Journal of Experimental Psychology, 1974, 102, 1116-1122.

Loftus, E. F., Wiksten, S., & Abelson, R. P. Using semantic memory to find versus create a word. Memory and Cognition, 1974, 2, 479-483.

Loftus, E. F. &. Palmer, J. C. Reconstruction of automobile destruction: An example of the interaction between language and memory. Journal of Verbal Learning and Verbal Behavior, 1974, in press.

Loftus, E. F. Retrieval from semantic memory: Some data and a model. Proceedings of the Linguistics Conference. Springer Publishing Co., in press.

Loftus, E. F., Senders, J. W., & Turkletaub, S. Retrieval of phonetically similar and dissimilar category members. American Journal of Psychology, in press.

Loftus, E. F. The incredible witness. Psychology Today, in press.

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Loftus, E. F. & Zanni, G. Eyewitness testimony: The influence of the wording of a question. Bulletin of the Psychonomic Society, 1975, in press.

B) Book chapter

Human information processing: Memory, language, and thought. Chapter prepared for I. Sarason & R. Smith, Introductory Psychology, Harper & Row.

C) Books

Mednick, S. A., Pollio, R. H., & Loftus, E. F. Learning. Englewood Cliffs, N. J.: Prentice Hall, 1973.

Loftus, G. R. & Loftus, E. F. Information and Human Memory. To be published by Lawrence Erlbaum Associates, Washington, D. C. 1975.

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Invited Addresses

Computer-assisted instruction: A tool for teaching refresher courses. Presented to the Civil Service Commission for the Educational Program in Systematic Analysis, Washington, D. C. 1969.

How do we retrieve information from semantic memory? Delivered to the Inter-disciplinary Conference in the Formal Aspects of Cognitive Processes, University of Michigan, Ann Arbor, Michigan, March 1972.

Retrieval from semantic memory. Delivered to the Eastern Verbal Investigator's League, New York, October 1972.

Invited Addresses (continued)

How to catch a zebra in semantic memory.
Invited address given at Conference on Cognition, Perception and Adaptation, Minneapolis, Minnesota, August 1973.
Colloquium given at:
Johns Hopkins University, January 1973
Harvard University, February 1973
Columbia University, April 1973
University of Colorado, November 1973

A lot of facilitation and a little interference in semantic memory.
Talk given at Bell Laboratories, February 1973.

How one memory retrieval affects subsequent retrieval. Delivered to the Perception Consortium of New York, March 1973.

Some aspects of eyewitness identification. Washington Defense Council. Seattle, February 1974.

Invited colloquia to be given at: University of Oregon, October 1974
University of Kansas, November 1974

Contributed Papers

Computer-assisted instruction: A tool for experimentation. National Council for the Social Studies Conference, Washington 1967.

Computer-based problem-solving. American Educational Research Association meetings, Los Angeles, California, 1969.

Retrieving words from long-term storage. Western Psychological Association, Los Angeles, California, 1970.

The retrieval of words from sub- and superordinate taxonomic categories. Psychonomic Society Meetings, San Antonio, Texas, 1970.

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The effect of category repetition on the speed of producing category instances from semantic memory. Eastern Psychological Association Meetings, Boston, Mass., April, 1972.

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Influence of one memory retrieved on a subsequent retrieval. Indiana Mathematical Psychology meetings, Bloomington, Indiana, April 1973.

Retrieval of superordinates and subordinates. Eastern Psychological Association, Washington, D. C., May 1973.

Retrieval of category members satisfying two constraints. American Psychological Association, Montreal, Canada, August 1973.

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Eyewitness identification: Reconstruction of automobile destruction. Paper presented in Symposium on Law and Psychology, Western Psychological Association, San Francisco, California, April 1974.

A question can influence an answer and a memory. Psychonomic Society, Boston, Mass., November 1974.

Dec. 1974

Incredible Eyewitness

by Elizabeth Loftus

"I SAW IT WITH MY OWN EYES." That statement has ended many an argument, since for most people seeing is believing. But it shouldn't be. Between the time you first witness an event and the time you recount it to someone else, your memory of the event may change drastically. Many factors can affect the accuracy of your report. I have found that the questions asked about an event influence the way a witness "remembers" what he saw. Changing even one word in a single question can systematically alter an eyewitness account.

Most previous research on this topic has been directed toward demonstrating how poor eyewitness testimony is, without exploring why people make the errors they do. One favorite method of study has been to stage an incident, then interrogate all the witnesses about what happened. Typically, everyone tells a different story.

In a study conducted at Dartmouth in the 1930s, some students unknowingly became subjects in such an experiment. While a class was in session, a man dressed in workman's overalls entered the room, made some remarks about the heat, tinkered with the radiator for a minute or two, and left. About two weeks later he returned with five other men of similar appearance, and the students were asked to pick him out from a lineup of all six individuals. Seventeen percent of the students chose the wrong man.

Another group of students, who had not witnessed the event but who were told they had seen it, also had to make a selection. Seventy percent of these subjects reported (correctly) that they could not recall the incident, but 29 percent did point to one of the men. That is, they "identified" a man they had never seen.

In a more recent study by Robert Buckhout and his colleagues at California State University, Hayward, 141 students witnessed a staged assault on a professor. Seven weeks later they were asked to pick out the assailant from a group of six photographs. Although the episode had been a dramatic one that could hardly have gone unnoticed, 60 percent of the witnesses, including the professor who had been attacked, chose the wrong man. Twenty-five percent selected an individual who had been at the scene of the crime, but as an innocent bystander.

Tragic Mistakes. This kind of demonstration is rather entertaining, but when something similar happens in real life, the results can be serious. A few months ago, the *Los Angeles Times* reported the erroneous conviction of a man whom seven witnesses had identified as the robber of a bank. In a similar case last year, 17 witnesses identified a man charged with shooting a police officer; later it turned out the man had not even been in the vicinity of the crime while it was going on. Innocent people have sat in prison for years on the strength of eyewitness testimony. The witnesses in these cases probably were all honest people, but they were tragically wrong.

Yet, despite the poor performance of eyewitnesses, judges and juries continue to place great faith in them. My colleagues and I recently studied the influence a single eyewitness can have in the courtroom. We simulated a criminal trial, using 150 students as jurors. The students received a written description of a grocery-store robbery in which the owner and his granddaughter were killed. They also received a summary of the evidence and arguments presented at the defendant's trial. Each juror had to arrive at a verdict, guilty or not guilty.

We told some of the jurors that there had been no eyewitnesses to the crime. We told others that a store clerk testified he saw the defendant shoot the two victims, although the defense attorney claimed he was mistaken. Finally, we told a third group of students that the store clerk had testified to seeing the shootings, but the defense attorney had discredited him. The attorney claimed the witness

An investigator who asks, "Did you see the broken headlight?" essentially says, "There was a broken headlight. Did you happen to see it?"

had not been wearing his glasses on the day of the robbery, and since he had vision poorer than 20/400 he could not possibly have seen the face of the robber from where he stood.

That's the Man. When we analyzed our results, we found that 82 percent of the jurors who had not heard about an eyewitness voted for acquittal, while 72 percent of those who thought there was a credible witness voted guilty. Most important, 68 percent of the jurors who had heard about the discredited witness still voted for conviction, in spite of the defense attorney's remarks. It seems that people are convinced by a witness who declares with conviction, "That's the man."

Percentage of Guilty Verdicts		
No Eyewitness	Eyewitness	Discredited Eyewitness
18%	72%	68%

Since eyewitness testimony carries so much weight, it is important to find out why distortion occurs in a witness' memory. I would like to know what goes on in a person's mind when he is trying to make a truthful report but makes a false one. To find the answer, one must consider the nature of human memory.

Studies of memory for sentences and pictures indicate that when we experience an event, we do not simply file a memory, then on some later occasion retrieve it and read off what we've stored. Rather, at the time of recall or recognition, we reconstruct the event, using information from many sources. These include both the original perception of the event and inferences drawn later, after the fact. Over a period of time, information from these sources may integrate, so that a witness becomes unable to say how he knows a specific detail. He has only a single, unified memory.

I studied the way leading questions can introduce new information that alters one's memory of an event. A leading question is one that by its form or content suggests to a witness the answer he should give, as in the classic "When did you stop beating your wife?" We all probably ask leading questions without realizing we are doing so. Lawyers, though, have long recognized the usefulness of deliberately asking such questions. They know that by the time the opposing lawyer objects and the judge rules the question improper, a suggestion may already have taken hold in the minds of the jurors.

Police undoubtedly use leading questions too, when they are interrogating witnesses to a crime. If they influence a witness to make a false statement (and that can happen easily, even with well-intentioned police officers), chances are good he will repeat the error later when a trial lawyer asks him to "tell in your own words what happened."

A famous example of police suggestion occurred in the 1921 case of Nicola Sacco and Bartolomeo Vanzetti, two Italian anarchists tried for murder and robbery in Massachusetts, at the height of nationwide hysteria over radicalism. Five prosecution witnesses identified Sacco at the trial, yet most of these witnesses had originally told police they could not identify anyone. Four witnesses identified Vanzetti, although one of them had earlier told police he had been unable to get a good look at the robbers. This same witness stated at the trial that he had had a very good look, after all. In fact, he was able to recall that the gunman had a dark complexion, high cheek bones, red cheeks, short hair, a trimmed mustache, a high forehead, and a hard, broad face. Sacco and Vanzetti were convicted of the crime, and eventually executed. A later investigation of the identification techniques used in this case indicated that witnesses had been subject to enormous suggestion from the police.

Traffic Accidents. Such cases, while instructive, do not prove conclusively that leading questions affect testimony. In order to examine more carefully the influence of the interrogator's language on an eyewitness, I took the problem into the laboratory. My assistants and I conducted several experiments, using students as eyewitnesses, and films of automobile accidents as the events they had to remember and report. Since we had a permanent record of each event, and we asked specially constructed questions, we were able to pinpoint the sources and types of inaccuracies.

In our first study, we showed 100 students a short film segment depicting a multiple-car accident. In the film, a car makes a right-hand turn into the main stream of traffic. The turn causes oncoming cars to stop suddenly, and there is a five-car, bumper-to-bumper collision. After our subjects viewed this film, they filled out a 22-item questionnaire containing 16 fillers and six critical questions. Three of the key questions asked about items that had appeared in the film, while three others asked about items that had not actually been present. For half the subjects, the critical questions began with the words *Did you see a*, as in "Did you see a broken headlight?" For the rest, the critical questions began with the words *Did you see the*, as in "Did you see the broken headlight?" Thus the sentences differed only in the form of the article, *the* or *a*.

We had a good reason to look at this contrast. A speaker uses *the* when he assumes the object referred to exists and may be familiar to the listener. An investigator who asks, "Did you see the broken headlight?" essentially says, "There was a broken headlight. Did you happen to see it?" His assumption may influence the witness. But *a* requires no such assumption.

When we tabulated the percentage of "yes," "no," and "don't know" responses, we found that witnesses who received questions with *the* were much more likely to report having seen something that had not really appeared in the film; 15 percent in the *the* group said "yes" when asked about a nonexistent item; while only seven percent in the *a* group made that error. On the other hand, witnesses who

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received questions with *a* were more likely to respond "don't know," both when the object had been present and when it had not. We see, then, that even this subtle change in wording can influence eyewitness reports.

Percentage of "Don't Know" Responses to Questions With "A" Or "The"

Item Present		Item Not Present	
the	*a*	*the*	*a*
23%	51%	13%	38%

Some Got Smashed. We also wanted to know whether the substitution of one word for another could affect quantitative judgments, e.g., judgments of speed. We showed 45 subjects seven films of traffic accidents, again varying the form of the questions we asked after the film. For some of our subject-witnesses, the critical question was "About how fast were the cars going when they hit each other?" For others we replaced the verb *hit* with *smashed, collided, bumped* or *contacted*. Although these words all refer to the coming together of two objects, they differ in what they imply about speed and force of impact. We wondered if these differences would affect judgments about velocity.

They did. Our subjects' estimates varied considerably, depending on which question they had to answer. Those questioned with *contacted* gave the lowest speed estimates, while those questioned with *smashed* gave the highest.

Average Speed Estimates for Different Verbs	
smashed	40.8 mph
collided	39.3 mph
bumped	38.1 mph
hit	34.0 mph
contacted	31.8 mph

Four of our films involved staged crashes, and we knew exactly how fast the cars had been traveling: one 20 mph, another 30 mph, and two others 40 mph. The average estimates for these collisions were 37.7, 35.2, 39.7 and 36.1 mph, respectively. These figures bear out previous findings that people are not very good at judging the speed of a vehicle, and increase our confidence that our results were due to the way our questions were worded.

The studies I've described so far do not tell us why people are influenced by leading questions. Perhaps they are merely biased by the form of the question to give one answer instead of another. For example, a witness might be uncertain whether to say 30 mph or 40 mph, but the verb *smashed* could sway him toward the higher estimate. In that case, we could not say that his memory of the event had changed, only that his answer had.

To find out if our subjects were really misremembering, we ran one more experiment. Again, we showed subjects a short film of a traffic accident. A third of them answered the question, "About how fast were the cars going when they smashed into each other?" Another third answered the same question with *hit* instead of *smashed*. The remaining third, which acted as a control group, did not get a question about automobile speed. As in our previous study, witnesses who saw *smashed* gave higher estimates than those who saw *hit*.

A week later our subjects returned. Without viewing the film again, they answered a new series of questions about it. This time, the critical question asked whether the witness had seen any broken glass, although, in fact, there had been none in the film. If *smashed* really influenced subjects to remember the accident as more severe than it had been, they might also "remember" details that were not shown but were commensurate with an accident occurring at high speed—like broken glass.

Our analysis showed that more than twice as many subjects queried with *smashed* reported seeing the nonexistent glass as those queried with *hit*. This result is consistent with our interpretation that memory itself undergoes a change as a result of the type of question asked.

Murder or Self-Defense? Eyewitnesses are inaccurate in estimating not only speed, but also time and distance. Yet in courts of law they must make quantitative judgments all the time. Last year I worked with the Seattle Public Defender's office on a case involving a young woman who had killed her boy friend. The prosecutor called it first-degree murder, but her lawyer claimed she had acted in self-defense. What was clear was that during an argument, the defendant ran to the bedroom, grabbed a gun, and shot her boy friend six times. At the trial, a dispute arose about the time that had elapsed between the grabbing of the gun and the first shot. The defendant and her sister said two seconds, while another witness said five minutes. The exact amount of elapsed time made all the difference in the world to the defense, which insisted the killing had occurred suddenly, in fear, and without a moment's hesitation. In the end the jury must have believed the defendant; it acquitted her.

I do not know whether leading questions played a role in this case, but I am sure they have in others. Accident investigators, police officers, lawyers, reporters and others who must interrogate eyewitnesses would do well to keep in mind the subtle suggestibility that words carry with them. When you question an eyewitness, what he saw may not be what you get.

Elizabeth Loftus, who received her Ph.D. from Stanford University in 1970, has published numerous articles on human memory and learning. In 1973 she coauthored *Learning* with Sarnoff Mednick and Howard Pollio (Prentice-Hall), and she is now completing a second book, *Memory and Information Processing*, with her husband Geoffrey. Loftus' recent work on eyewitness testimony, which was supported by a grant from the Department of Transportation, developed from a desire to do some applied research. Loftus is assistant professor of psychology at the University of Washington, and is on the editorial board of the *Journal of Experimental Psychology: Human Learning and Memory*.