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Foibles of Witness Memory for Traumatic/High Profile Events

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FOIBLES OF WITNESS MEMORY FOR TRAUMATIC/HIGH PROFILE EVENTS

DEBORAH DAVIS*

WILLIAM C. FOLLETTE**

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I. INTRODUCTION

“The jury, or at least the judge, should know how far errors in recollection are normal and how they vary under different conditions.”

J. McKeen Cattell¹

A FEW YEARS ago, Nevada politician Robert Seale took off in his Cessna 410 heading for a campaign tour of rural Nevada with his wife, two other candidates for office, and a member of the campaign staff. Seale had owned the plane for several months, noticing during that time that the left engine was difficult to start. Despite these difficulties, Seale continued to use the plane.

On the day of the Cessna 410 crash, Seale experienced a left-engine out on take-off. He turned the plane around, located an open field, and attempted to land. Unfortunately, the plane ran into a hidden gully as it landed and crashed. Seale’s wife was killed, and he and the other passengers were severely injured.

Initially, Seale testified that he had feathered the propeller, a procedure necessary to maintain altitude and maneuverability during an engine out situation. Pictures of the cockpit taken at the scene, however, showed the throttle still in full open position. Did Seale deliberately lie to protect himself? Or did he honestly “remember” that he had, indeed, feathered the propeller? If so, did his desire to protect himself from any blame for his wife’s death and his friends’ injuries fuel his “memory” that he

¹ John McKeen Cattell, *Measurements of the Accuracy of Recollection*, in SCIENCE 761-766 (1895).

followed proper procedure? Or did the ingrained knowledge of the routine procedure for engine out on take off make him assume that is what he did?

Mechanics who worked on the plane testified that they had checked the engine and had it running correctly. Had they? Or did they “remember” in hindsight that they had actually done what hindsight told them they should have?

Ground witnesses testified that they heard the engine stall and sputter before take off. Did they? Or did hindsight tell them it must have been that way?

Other passengers testified that they had asked Seale about the safety of the engine and that he had reassured them. Did hindsight and the motivations associated with their liability suits cause them to “remember” falsely? Or did they actually ask Seale about the engine before the crash?

Modern memory research would suggest that although false testimony may be deliberate, it is more often sincere. Motivations and biases such as those alluded to in the Seale case pervasively influence memory such that witnesses sincerely believe the false reports they provide in court. They become, in effect, “honest liars.”

Notwithstanding the potential for error in memory, American courts rely extensively, and in some cases exclusively, on witnesses’ recollections to provide the “facts” of the cases before them. These recollections range from the details of a particular event to an event’s many antecedents and consequences. They run the gamut of recollections—from those of the observer’s own thoughts or behavior to the statements and behaviors of others, and from physical events to documents and conversations, among many other things. They refer not only to overt observable behaviors, objects, and events, but also to pertinent motives, intentions, or other interpretations of what happened and why. In other words, witnesses must testify about virtually all aspects of everyday life, from the more usual everyday activities leading up to the target event or the more unusual to traumatic, acute incidents that lead to trial. Indeed, it is hard to imagine a trial without witnesses.

In fact, everyday life would not be possible without memory. But memory has a darker side, fraught with forgetting, errors and distortions. We forget things sometimes almost as soon as they happen. We remember things that did not actually happen as if they did, and we remember things that did happen incor-

rectly. Daniel L. Schacter² referred to this duality of vast capacity and susceptibility to error as memory's "*fragile power*," and offered a list of memory's foibles, which he termed the "*seven sins of memory*."

Just as the biblical seven deadly sins (pride, anger, envy, greed, gluttony, lust, and sloth) occur frequently in daily life, so do the seven sins of memory. These can be broadly divided into three categories³ including sins of *forgetting* (either temporary or permanent inability to remember), *distortion or inaccuracy* (remembering incorrectly), and *persistence* (pathological intrusive remembrances, or information we cannot forget even though we wish we could).

A. WHY IS WITNESS MEMORY A PROBLEM?

"[M]emory, whether we like it or not, is one more source of fiction . . ."⁴

The "*sins*" of the darker side of memory are often innocuous and merely inconvenient, such as difficulties remembering where we put our keys, the name of a former colleague, or what movie we saw last. Other "*sins*" are more serious, such as those experienced by elderly people when they forget to make an important appointment, forget to take necessary drugs, or even forget to eat.

Memory errors in court may sometimes be similarly unimportant. However, the outcome of a case will often turn on the testimony of witnesses—sometimes on the testimony of a *single* witness. In such instances, where witness testimony may replace or outweigh physical evidence, it is crucial for jurors to have the means to evaluate its accuracy.

Jurors are clearly aware that a witness may consciously deceive, choosing to falsely report their memories of relevant facts. They consider any vested interest the witness may have in the outcome of the case and try to monitor the testimony of fact or expert witness for evidence of truth or deceit. Unfortunately, research on detection of deception has shown that few people, including jurors, judges, attorneys, psychologists, or other professionals and laypersons, are able to reliably detect deception.

² DANIEL L. SCHACTER, *SEARCHING FOR MEMORY: THE BRAIN, THE MIND, AND THE PAST* 7-8 (1996); Daniel L. Schacter, *The Seven Sins of Memory: Insights from Psychology and Cognitive Neuroscience*, 54 AM. PSYCHOLOGIST 182 (1999).

³ Schacter, *The Seven Sins of Memory*, *supra* note 2, at 182.

⁴ Paul J. Eakin, *Autobiography, Identity, and the Fictions*, in *MEMORY, BRAIN, & BELIEF* 290, 291 (D.L. Schacter & Elaine Scarry eds., 2000).

More than twenty years of research has shown that the average accuracy in judging truthfulness rarely exceeds 60% (chance performance being 50%), with some falling below chance ability.⁵

Alone, jurors' inabilities to detect deception represent a substantial problem for evaluation of witness accuracy. Memory research, however, has clearly demonstrated that false reports come not only from false intentions, but also from false recollections, the latter arguably being a more frequent source of error. Unfortunately, whereas distortion and inaccuracy in memory is commonplace, judges, attorneys, and jurors are generally unaware of the frequency and causes of such honest errors. Thus, jurors suffer from a dual problem in evaluation of accuracy (as opposed to honesty) in witness memory. That is, jurors lack understanding of the fact that memory is much more fallible than they think, *and* lack understanding of when and under what circumstances memory is most likely to be inaccurate. In other words, jurors both *underestimate the need* to try to evaluate the potential for honest failures of memory and *lack understanding* of how to make such an evaluation if they know they should.

To summarize then, witness memory is a problem because:

(1) Witness testimony includes a host of honest errors of memory, and

(2) There are many features of the event, the parties involved, or the witness that are known to reduce witness accuracy, sometimes to the point that virtually no witness can accurately describe the event or the parties at issue.

However,

(3) Jurors underestimate the potential for *honest* errors of memory; and, therefore,

(4) Jurors tend to believe that witness testimony (particularly that of uninterested witnesses) is accurate, although

(5) Jurors do *not* accurately understand the conditions under which witness testimony is most and least likely to be accurate; and, therefore,

(6) Jurors are unable to distinguish reliably between accurate and inaccurate witnesses.

Nevertheless,

⁵ Paul Ekman & Maureen O'Sullivan, *Who Can Catch a Liar?*, 46 AM. PSYCHOLOGIST 913 (1991).

(7) Jurors frequently decide a case solely on the basis of eyewitness testimony (for example, convicting a criminal defendant solely on the basis of a single eyewitness's identification), and thus,

(8) Jurors often make erroneous decisions on the basis of testimony from inaccurate witnesses.

Documented sources of error in eyewitness testimony combined with jurors' tendencies to over-believe the witnesses are widely considered by social scientists to account for a large number of erroneous verdicts. This conclusion has been best supported by studies of wrongful convictions of defendants proven innocent by evidence uncovered after trial. Eyewitness identifications of perpetrators, for example, are largely responsible for many false convictions.

One systematic investigation of various sources of miscarriages of justice has singled out mistaken identification as the number one source of error,⁶ being responsible for 52% of the wrongful convictions identified. More recently, DNA analyses have freed at least sixty-two wrongfully convicted prisoners.⁷ Eyewitnesses convicted the vast majority of these prisoners largely on the basis of mistaken identification.⁸ Gary Wells⁹ found that of forty exonerations, mistaken identification was involved in thirty-six of the cases involving fifty separate eyewitnesses mistakenly identifying the defendants. Barry Scheck's¹⁰ analysis of the full sixty-two cases identified fifty-two cases involving mistaken identifications by seventy-seven confident, but mistaken, eyewitnesses.

While there are many sources of error in actual witness memory, jurors generally show three forms of misunderstanding or misuse of eyewitness testimony. First, they tend to over-believe eyewitness testimony, assuming greater-than-realistic accuracy. Second, they misunderstand the variables that affect accuracy, and thus do not adjust their judgments of accuracy properly. Finally, they cannot discriminate between accurate and inaccu-

⁶ Arye Rattner, *Convicted but Innocent: Wrongful Conviction and the Criminal Justice System*, 12 LAW & HUM. BEHAV. 283, 289 (1988).

⁷ BARRY SCHECK ET AL., ACTUAL INNOCENCE: FIVE DAYS TO EXECUTION AND OTHER DISPATCHES FROM THE WRONGLY CONVICTED 73 (2000).

⁸ EDWARD CONNORS ET AL., CONVICTED BY JURIES, EXONERATED BY SCIENCE: CASE STUDIES IN THE USE OF DNA EVIDENCE TO ESTABLISH INNOCENCE AFTER TRIAL 24 (1996); Gary L. Wells et al., *Eyewitness Identification Procedures: Recommendations for Lineups and Photospreads*, 22 LAW & HUM. BEHAV. 603, 605 (1998).

⁹ See Wells, *supra* note 8, at 606-608.

¹⁰ See SCHECK, *supra* note 7, at 73.

rate witnesses. These failings are documented in a number of sources.¹¹

1. *The Special Issue of Witness Confidence*

The issue of the relationship between witness confidence and accuracy is particularly important since confidence is the single cue to accuracy jurors rely on most. There is widespread belief (among college students, jurors, police officers, trial lawyers, and even the U.S. Supreme Court) that witness accuracy and witness confidence are highly correlated.¹²

Given this widespread belief, it should not be surprising that there is substantial evidence that *jurors* (and mock jurors) substantially rely on witness confidence to judge the accuracy of the witness's testimony.¹³ Further, jurors tend to give more weight to the confidence of the witness than to factors that are more predictive of accuracy. Wells, R.C. Lindsay, and their colleagues have demonstrated this in a series of studies.¹⁴

¹¹ See generally Kenneth A. Deffenbacher & Elizabeth F. Loftus, *Do Jurors Share a Common Understanding Concerning Eyewitness Behavior*, 6 LAW & HUM. BEHAV. 15, 26 (1982); ELIZABETH F. LOFTUS & JAMES M. DOYLE, EYEWITNESS TESTIMONY: CIVIL AND CRIMINAL 75 (1987); Peter N. Shapiro & Steven Penrod, *Meta-Analysis of Facial Identification Studies*, 100 PSYCHOL. BULL. 139 (1986); GARY L. WELLS & ELIZABETH F. LOFTUS, EYEWITNESS TESTIMONY: PSYCHOLOGICAL PERSPECTIVES 87 (1984); Kipling D. Williams et al., *Eyewitness Evidence and Testimony*, in HANDBOOK OF PSYCHOLOGY AND LAW 141 (Dorothy K. Kagehiro & W. S. Laufer eds., 1992).

¹² John C. Brigham & Melissa P. Wolfskeil, *Opinions of Attorneys and Law Enforcement Personnel on the Accuracy of Eyewitness Identifications*, 7 LAW & HUM. BEHAV. 337, 344 (1983); Deffenbacher & Loftus, *supra* note 11, at 19-21; *Manson v. Brathwaite*, 432 U.S. 98, 114-116 (1977); *Neil v. Biggers*, 409 U.S. 188, 199-200 (1972); A. Daniel Yarmey & Hazel P. Jones, *Is the Psychology of Eyewitness Identification a Matter of Common Sense*, in EVALUATING WITNESS EVIDENCE 13 (S. Lloyd-Bostock & B.R. Clifford eds., 1983).

¹³ John C. Brigham & Robert K. Bothwell, *The Ability of Prospective Jurors to Estimate the Accuracy of Eyewitness Identifications*, 7 LAW & HUM. BEHAV. 19, 28 (1983); S.G. Fox & H.A. Walters, *The Impact of General Versus Specific Expert Testimony and Eyewitness Confidence Upon Mock Juror Judgment*, 10 LAW & HUM. BEHAV. 215, 224-25 (1986); R.C. Lindsay et al., *Can People Detect Eyewitness Identification Accuracy Within and Across Situations?* 66 J. APPL. PSYCHOL. 79 (1981); Gary L. Wells & Michael R. Leippe, *How Do Triers of Fact Infer the Accuracy of Eyewitness Identifications? Using Memory for Peripheral Detail Can Be Misleading*, 66 J. APPL. PSYCHOL. 682 (1981).

¹⁴ R. C. Lindsay et al., *Mock Juror Belief of Accurate and Inaccurate Eyewitnesses: A Replication and Extension*, 13 LAW & HUM. BEHAV. 333, 336-37 (1989); Lindsay, *supra* note 13, at 79; Gary L. Wells et al., *The Tractability of Eyewitness Confidence and Its Implications for Triers of Fact*, 66 J. APPL. PSYCHOL. 688 (1981); Wells & Leippe, *supra* note 13, at 682; Gary L. Wells et al., *Accuracy, Confidence, and Juror Perceptions in Eyewitness Identification*, 64 J. APPL. PSYCHOL. 440 (1979); Gary L. Wells et al.,

Across all of these studies, mock jurors were unable to discriminate between accurate and inaccurate witnesses. Witness confidence was a strong predictor of *perceived* accuracy, whereas: (1) confidence was not *actually* significantly related to accuracy, and (2) mock juror *perceptions of witness accuracy* were not related to *actual witness accuracy*. In fact, juror perceptions of witness confidence accounted for as much as 50% of the variance in juror judgments of accuracy. Brian Cutler and his colleagues¹⁵ found that out of ten witness variables known to affect actual accuracy, only confidence predicted perceptions of accuracy and verdicts. Thus, it is clear that witness confidence has a dramatic influence on jurors' perceptions of witness accuracy.

It is equally clear that confidence is not a good predictor of witness accuracy. Recent reviews and meta-analyses of the literature on the relationship between eyewitness confidence and accuracy have uniformly concluded that witness confidence is only modestly (at best) related to accuracy—either between or within subjects.¹⁶

Effects of Expert Psychological Advice on Human Performance in Judging the Validity of Eyewitness Testimony, 4 LAW & HUM. BEHAV. 275, 282-83 (1980).

¹⁵ Brian L. Cutler et al., *Juror Sensitivity to Eyewitness Identification Evidence*, 14 LAW & HUM. BEHAV. 185, 188-190 (1990); Brian L. Cutler et al., *Juror Decision Making in Eyewitness Identification Cases*, 12 LAW & HUM. BEHAV. 41, 48-51 (1988).

¹⁶ Brian H. Bornstein & Douglas J. Zickafoose, "I Know I Know It, I Know I Saw It": *The Stability of the Confidence-Accuracy Relationship Across Domains*, 5 J. EXP. PSYCHOL. APPL. 76 (1999); Robert K. Bothwell et al., *Correlation of Eyewitness Accuracy and Confidence: Optimality Hypothesis Revisited*, 72 J. APPL. PSYCHOL. 691 (1987); Peter Juslin et al., *Calibration and Diagnosticity of Confidence in Eyewitness Identification: Comments on What Can Be Inferred from the Low Confidence-Accuracy Correlation*, 22 J. EXP. PSYCHOL. LEARN. MEM. COGN. 1304 (1996); Saul M. Kassin et al., *The "General Acceptance" of Psychological Research on Eyewitness Testimony*, 44 AM. PSYCHOL. 1089 (1989); Saul M. Kassin, et al., *The Accuracy-Confidence Correlation in Eyewitness Testimony: Limits and Extensions of the Retrospective Self-Awareness Effect*, 61 J. PERS. & SOC. PSYCHOL. 698 (1991); C. A. Elizabeth Luus & Gary L. Wells, *The Malleability of Eyewitness Confidence: Co-Witness and Perseverance Effects*, 79 J. APPL. PSYCHOL. 714 (1994); Jennifer Nolan & Roslyn Markham, *The Accuracy-Confidence Relationship in an Eyewitness Task: Anxiety as a Modifier*, 12 APPL. COGN. PSYCHOL. 43 (1998); Nils Olsson, *A Comparison of Correlation, Calibration, and Diagnosticity as Measures of the Confidence-Accuracy Relationship in Witness Identification*, 85 J. APPL. PSYCHOL. 504 (2000); Timothy J. Perfect & Tara S. Hollins, *Predictive Feeling of Knowing Judgements and Postdictive Confidence Judgements in Eyewitness Memory and General Knowledge*, 10 APPL. COGN. PSYCHOL. 371 (1996); Timothy J. Perfect et al., *Accuracy of Confidence Ratings Associated with General Knowledge and Eyewitness Memory*, 78 J. APPL. PSYCHOL. 144 (1993); J. Don Read et al., *The Unconscious Transference Effect: Are Innocent Bystanders Ever Misidentified*, 4 APPL. COGN. PSYCHOL. 3 (1990); Michael D. Robinson & Joel T. Johnson, *How Not to Enhance the Confidence-Accuracy Relation: The Detrimental Effects of Attention to the Identification Process*, 22 LAW & HUM. BEHAV. 409, 410 (1998); Vicki L. Smith et al., *Eyewitness Accuracy and*

There is also some evidence that eyewitness confidence is, in part, a stable individual difference variable. Looking at accuracy-confidence relationships *within* individual subjects, Evan Brown, Kenneth Deffenbacher, and Sturgill¹⁷ found that a given eyewitness's confidence when correct was highly correlated with that person's confidence when incorrect. In contrast, however, a given eyewitness's confidence when correct was not significantly higher than that same person's confidence when incorrect. In other words, a person's confidence in his/her own eyewitness testimony seems to be determined more by whether (s)he is a confident person than by the accuracy of his/her testimony.¹⁸

To summarize, jurors are strongly affected by the confidence of the witness. Such that they are very likely to believe a confident witness. Unfortunately, overall, confident witnesses are not reliably more accurate than less confident witnesses.

It is important to note that the research documenting these effects was conducted with eyewitness accounts of crimes, persons, and events that did not directly involve them. Thus, the witnesses were uniformly free from any personal involvement or motivation that might promote false accounts. Even in such circumstances, witness confidence was unrelated to accuracy.

a. Procedures that Cause Distortion in Memory Also Enhance Confidence

Confidence in our memories is dependent on many factors, not just the validity of our memories. Unfortunately, many things that affect confidence also carry great potential to cause distortion in memory. For example, most of the common procedures used to aid memory retrieval or to prepare for trial have been shown both to cause distortion in memory and simultaneously to enhance witness confidence. These include such common techniques as hypnosis, guided imagery, repeated

Confidence: Within-Versus Between-Subjects Correlations, 74 J. APPL. PSYCHOL. 356 (1989); Siegfried L. Sporer et al., *Choosing, Confidence, and Accuracy: A Meta-Analysis of the Confidence-Accuracy Relation in Eyewitness Identification Studies*, 118 PSYCHOL. BULL. 315 (1995); Gary L. Wells & Donna M. Murray, *Eyewitness Confidence*, in EYEWITNESS TESTIMONY: PSYCHOLOGICAL PERSPECTIVES, 155 (Gary L. Wells & Elizabeth F. Loftus eds., 1984).

¹⁷ Evan Brown et al., *Memory for Faces and the Circumstances of Encounter*, 62 J. APPL. PSYCHOL. 311 (1977).

¹⁸ Perfect & Hollins, *supra* note 16, at 371.

questioning, preparation for cross-examination, and many others, as shown in the sections below.

2. *Summary: The Problem with Witness Memory*

Research using varying methods has converged on the twin conclusions that: (1) witness memory is subject to many sources of error and distortion, and (2) empirical findings regarding factors that actually affect eyewitness accuracy are often inconsistent with lay *assumptions* about the factors that influence eyewitness performance and thus with the criteria jurors actually use to evaluate witness accuracy.¹⁹ Witnesses tend to use the least accurate cue (confidence) and remain unaffected (or minimally affected) by other cues that more strongly predict witness accuracy. Thus, there is clear evidence that jurors possess neither an adequate nor accurate understanding of witness memory and what may affect accuracy.

It is this conflict between how memory *actually* works and how jurors *believe* it works that has led to the rise in use of memory experts in court. Expert testimony on witness memory is useful for the jury in that it gives them a more accurate basis for evaluation of the accuracy of witness testimony. Expert testimony is also useful for the explanation of the *implications* of failures in memory. For example, an expert may explain the impact of trauma, such as rape or other extreme violence, on memory to help jurors understand the implications of temporary or permanent lapses of memory of the victim. Finally, memory experts may be useful for the attorney in preparing motions to exclude testimony based on issues of probable witness inaccuracy or for preparation for cross-examination of a witness.

The remainder of this article will provide an explication of how memory works. In doing so, it will explain common *causes*

¹⁹ Brigham & Bothwell, *supra* note 13, at 20; Brigham & Wolfskeil, *supra* note 12, at 346-47; Cutler et al., *Juror Sensitivity to Eyewitness Identification Evidence*, *supra* note 15, at 190; Cutler et al., *Juror Decision Making in Eyewitness Identification Cases*, *supra* note 15, at 53; Deffenbacher & Loftus, *supra* note 11, at 24; Michael R. Leippe et al., *Crime Seriousness as a Determinant of Accuracy in Eyewitness Identification*, 63 J. APPL. PSYCHOL. 345 (1978); Elizabeth Noon & Clive R. Hollin, *Lay Knowledge of Eyewitness Behaviour: A British Survey*, 1 APPL. COGN. PSYCHOL. 143 (1987); Gary L. Wells, *How Adequate is Human Intuition for Judging Eyewitness Testimony*, in EYEWITNESS TESTIMONY: PSYCHOLOGICAL PERSPECTIVES 256 (Gary L. Wells & Elizabeth F. Loftus eds., 1984); Gary L. Wells, *The Eyewitness*, in THE PSYCHOLOGY OF EVIDENCE AND TRIAL PROCEDURE 43 (Saul M. Kassin & L.S. Wrightsman eds., 1985); WELLS & LOFTUS, *supra* note 11, at 87; Williams et al., *supra* note 11, at 141; Yarmey & Jones, *supra* note 12, at 13.

of memory failure and distortion and identify typical *categories of errors* that follow from specific causal processes, providing examples pertinent to the legal system, particularly aviation litigation, as it proceeds. Finally, the article will end with a discussion of how memory researchers can be helpful as consultants or expert witnesses. Throughout the article, the discussion will be confined to sources of *unintentional* errors.

The discussion of the foibles of witness memory will be based on principles of memory discovered over the full history of memory research. Thus, some research citations will not pertain specifically to witness memory, although the principles by which memory operates are constant and will apply unchanged to analogous witnessing circumstances.

Further, much of the scientific literature dealing with witness memory has addressed issues relevant to criminal trials, with the greatest emphasis on factors related to accuracy in identification of perpetrators of crime and, to a lesser extent, emphasis on factors related to reports of the criminal events. More recently, extensive literature has developed concerning the potential for trauma-induced loss or "*repression*" of memories and the potential for memory distortion induced by common techniques or processes for "*recovery*" of those memories, particularly in cases concerning child sex abuse or rape. Finally, a small but growing body of literature has begun to examine factors determining the accuracy of conversational memory—an area vitally important to civil trials in particular, and an area where expert testimony is beginning to appear. Thus, many of our research examples will come from these areas of witness memory research.

II. FUNDAMENTALS OF MEMORY PROCESSES

Modern scientific theories of memory suggest that our memory system operates in three general stages: (1) *Acquisition* (or Encoding), when information is first transferred into our memory system; (2) *Storage*, while information is maintained in memory over a period of time; and (3) *Retrieval*, when information is located and retrieved from storage. At each stage, memory may be compromised by failure or inaccuracy.

III. ACQUISITION/ENCODING

At the acquisition stage, information about an event is perceived by the observer and processed for storage in memory.

The popular “*modal model*” of memory²⁰ proposes that three sub-systems of memory operate at the acquisition stage. Information moves between them through active “*control processes*” such as focusing of attention, rehearsal, and thinking, but may be disrupted or distorted in the process.

A. SENSORY REGISTERS

The first stage of encoding (entry into memory) is called the “*sensory register*,” which perceives information in its original physical form just long enough for us to determine if some aspect of input is worthy of further attention. Visual information in the sensory register decays within less than a second, and auditory information decays within a few seconds. At this stage, information may be lost through disruption of sensory processes, resulting in failure to *ever* encode the information or failure to encode it *clearly*. For example, a witness may fail to encode some aspect of an event in sensory memory (either clearly or at all) because *at the time it occurred* something interfered with the opportunity to observe clearly.

B. SHORT-TERM (OR WORKING) MEMORY

Given that the observer has had the opportunity to observe, the information may or may not enter short-term memory before it is lost. Information from the sensory registers enters short-term memory if and when it becomes the focus of attention. Those sensory impressions that do not engage attention are lost within a few seconds. In turn, information that does enter short-term memory will decay within thirty seconds unless sustained by continued attention, rehearsal, and elaboration. Those features that do engage attention, rehearsal, and elaboration are more likely to enter long-term memory.

C. LONG-TERM MEMORY

The “*modal model*” of memory²¹ suggests that information from short-term memory enters long-term memory through “*elaborative rehearsal*”—the process of thinking about the information and relating it to other information already in long-term memory. If elaborative rehearsal is prevented by distraction or

²⁰ R.C. Atkinson & R.M. Shiffrin, *Human Memory: A Proposed System and Its Control Processes*, in 2 THE PSYCHOLOGY OF LEARNING AND MOTIVATION 89 (K.W. Spence & J.T. Spence eds., 1968).

²¹ See *id.* at 89-195.

other factors, information in short-term memory will be lost.²² With greater interference or distraction associated with faster and greater information loss.²³

Some controversy exists concerning the exact nature of the relationship between the three memory systems, and the sequence in which information is processed. For example, there has been increasing attention to the "*Parallel Distributed Processing*" model of Stephan Lewandowsky and Bennet Murdock.²⁴ The model suggests that information is processed simultaneously in several different parts of the total memory system. Sensory impressions, for example, must engage information in long-term memory for recognition of an object to occur in short-term memory. However, despite competing theoretical perspectives regarding the exact nature of the interaction between memory systems and the exact processes by which memory operates, research has converged in identification of factors that tend to compromise memory through failures of encoding.

These failures include both failures to encode the information at all and inaccuracy in encoding. If the information does reach long-term storage, memory may still be inaccurate. That is, if the information is not encoded accurately, it will not be later retrieved accurately. Thus, much general memory research, and specifically witness memory research, has focused on factors that may interfere with the accuracy of encoding. Generally, three types of factors have been investigated: (1) the nature of events witnessed; (2) the conditions under which they are witnessed (lighting, for example); and (3) characteristics of the witness (either enduring characteristics or temporary states).

Each of these factors tends to affect encoding through either: (a) the ability to clearly see or perceive the event; (b) effects on the amount of attention and therefore, information processing capacity devoted to the event itself or to the particular aspect of the event (such as a central party versus peripheral actors or characteristics of the setting); or (c) biasing the *interpretation* of what is witnessed, and therefore what one later remembers.

²² Lloyd R. Peterson & Margaret J. Peterson, *Short-Term Retention of Individual Verbal Items*, 58 J. EXP. SOC. PSYCHOL. 193, 197-198. (1959).

²³ Judith S. Reitman, *Without Surreptitious Rehearsal, Information in Short-Term Memory Decays*, 13 J. VERB. LEARN. & VERB. BEHAV. 365, 375 (1974).

²⁴ Stephan Lewandowsky & Bennet B. Murdock, *Memory for Serial Order*, 96 PSYCHOL. REV. 25, 51 (1989).

IV. FAILURES OF ACQUISITION/ENCODING

A. FAILURES OF PERCEPTION

1. *Failures of Opportunity to Observe*

The Importance of Clarity of Perception. Intuition would tell us that anything affecting a witness's opportunity to observe the events in question would affect accuracy. To the extent one remembers an event at all, one will at best remember only what was originally witnessed. Thus, it follows without question that if one is unable to see or hear clearly at the time the event is witnessed, one will be unable to remember it any more clearly later on. Indeed, the U. S. Supreme Court has accepted this assertion as a criterion for judging eyewitness reliability.²⁵

The eyewitness literature has documented negative effects on witness accuracy stemming from factors compromising either the *opportunity* or *ability* to observe clearly. These include physical features of the *environment*, such as noise or other acoustical interference, or factors compromising vision such as poor or sudden changes in lighting, obstructions, and distance between the observer and the event in question. Also included are features of *persons or objects being observed*, including a perpetrator's obstructing hats, clothing, or disguise.²⁶

Important *observer* factors including age, degree of visual, olfactory, auditory or tactile sensory loss, or temporary incapacities such as extreme stress, blindfolding, drug or alcohol use, can also affect accuracy through ability to observe.²⁷

²⁵ See *Neil v. Biggers*, 409 U.S. 188, 199-200 (1972) (listing factors bearing on whether a line-up identification procedure was overly suggestive).

²⁶ Brian L. Cutler et al., *The Reliability of Eyewitness Identifications: The Role of System and Estimator Variables*, 11 LAW & HUM. BEHAV. 223 (1987); K. E. Patterson & A. D. Baddeley, *When Face Recognition Fails*, 3 J. EXP. PSYCHOL. HUM. LEARN. & MEM. 406, 416 (1977); Siegfried L. Sporer, *Clothing as a Contextual Cue in Facial Recognition*, 17 GERMAN J. PSYCHOL. 183 (1993).

²⁷ Brigham & Bothwell, *supra* note 13, at 19; Brigham & Wolfskiel, *supra* note 12, at 337; Cutler et al., *Juror Sensitivity to Eyewitness Identification Evidence*, *supra* note 15, at 185; Cutler et al., *Juror Decision Making in Eyewitness Identification Cases*, *supra* note 15, at 41; Deffenbacher & Loftus, *supra* note 11, at 15; Leippe et al., *supra* note 19, at 345; Noon & Hollin, *supra* note 19, at 143; Wells, *How Adequate is Human Intuition for Judging Eyewitness Testimony*, *supra* note 19, at 242; Wells, *The Eyewitness*, *supra* note 19, at 43; WELLS & LOFTUS, *supra* note 11, at 87; Williams et al., *Eyewitness Evidence and Testimony*, *supra* note 11, at 141; Yarmey & Jones, *supra* note 12, at 13.

2. *Duration of Exposure*

Clearly, the opportunity to observe any aspect of an event depends in part on the length of time one can observe it. In part, longer exposure allows time for sensory impressions to receive adequate attention, and for the elaborative rehearsal necessary to transfer information from short to long-term memory. Not surprisingly, a number of studies in the basic memory literature have shown memory to depend upon length of exposure. Similarly, the eyewitness literature has shown that eyewitness reports are more accurate after a longer exposure to a perpetrator or event.²⁸

Duration of exposure may also be reflected in the *frequency* of exposure. Just as memory for any information is facilitated by frequent exposure or practice, so is memory for people and events. The more often a person is seen, for example, the easier it is to identify him.²⁹

Opportunity to observe may be a problem in many respects with regard to aviation accidents. Among them is the speed of unfolding events. Many plane crashes happen rapidly with little warning of the trouble that will cause the crash and with little time between the onset of the problem and the crash. It may be less than thirty seconds, for example, between an engine out on take-off and contact with the ground. Regardless of the interval between the first sign of trouble and the crash, however, events tend to unfold rapidly with little opportunity to observe every detail or to attend to any individual detail for a long period of time.

Although one might expect that we ourselves (and the average witness) would be aware of the limitations of our memories for what we never clearly perceived, this is often not the case. A very large body of literature in the eyewitness identification area has repeatedly shown that witnesses asked to identify the perpetrator of staged crimes or to describe other witnessed events do so confidently, although the event itself provided little opportunity to observe clearly. The poorest "*witnessing conditions*" (such as poor lighting, brief exposure, great distance, perpetrator wearing a hat, etc.), where the rate of accuracy of identification of the perpetrator may be as low as 10%, nevertheless produce

²⁸ Shapiro & Penrod, *supra* note 11, at 139.

²⁹ Glenn S. Sanders & Dell H. Warnick, *Some Conditions Maximizing Eyewitness Accuracy: A Learning/Memory Model*, 2 BAS. APPL. SOC. PSYCHOL. 67 (1979).

large numbers of witnesses willing to positively (but inaccurately) identify a perpetrator with confidence.

We are equally unaware of the foibles of *others'* memories. For example, Cutler, Penrod and Stuve,³⁰ as described earlier, had mock jurors observe one of a number of versions of the reenactment of a trial. Ten factors that have been shown to affect eyewitness accuracy were varied, including some regarding opportunity to observe. Among these, only eyewitness *confidence* affected mock juror judgments of witness accuracy, even though the mock jurors did recall testimony regarding each of the nine other factors that are known to compromise accuracy. Thus, the damaging impact of poor witnessing conditions (and other biasing influences) is underestimated by both the witnesses themselves and by the jurors who base their judgments on witness testimony.

Similarly, factors that may compromise witness *ability* to observe may be unknown to both the witness and the jury, such as age-related failures of attention, hearing, vision (both general and color specific), or understanding. For example, ability to taste declines rapidly with age, a fact unknown to most people.

B. "ABSENT-MINDEDNESS" AND FAILURES OF PROCESSING

Memory may also fail because of insufficient attention and/or depth of processing. Schacter³¹ referred to these deficiencies as "*absent-mindedness*"—the second deadly sin of memory.

1. *Memory Depends Upon Attention*

It has been demonstrated in countless areas of research and is uncontested among psychological researchers that: (a) memory follows the focus of attention, such that what is most focused on will be remembered better; and (b) that memory is a function of the amount of attention devoted to a particular event or object. Memory is better for any object or event where more attention is devoted to it. This includes both the *quality* of attention (concentration, lack of distraction) and/or the *duration* of attention. Events that are not attended to will be poorly remembered, if at all. Further, *features* of an event that are not well attended to will be remembered poorly. Thus, anything about the event, the conditions under which it is witnessed, or the state of those wit-

³⁰ Cutler et al., *Juror Decision Making in Eyewitness Identification Cases*, *supra* note 15, at 41.

³¹ Schacter, *supra* note 2, at 182.

nessing it that reduces either the amount or the quality of attention to it will also impair memory.

The effects of the focus of witness attention have been demonstrated in several ways in the eyewitness literature. For example, Cutler, Penrod and Martens³² directly told subjects what to attend to when exposed to a videotaped scene. Subjects remembered the aspects they focused on better than those they did not. Similarly, Reinitz, Morrissey and Demb³³ directly manipulated how much attention a subject could devote to a face by subjecting some subjects to distraction while viewing the face. They found that later recognition was superior for faces originally viewed without distraction. Moreover, the importance of attention has been further demonstrated through studies of the impact of selective attention to some features of a scene and not others.

2. *Memory Depends Upon the Depth of Processing*

Both the amount and quality of attention and the "*depth of processing*" of information (referring to the amount of thinking about it or analyzing it) will affect memory. Daniel Schacter³⁴ considered shallow processing to be the second prong of the sin of "*absent-mindedness*."

Information may be encoded on a continuum from shallow to deep, with deeper processing producing better memory.³⁵ Presumably, memory is enhanced because deeper processing may lead to a stronger and more elaborate memory trace. The more elaborate the memory trace, the more distinctive it becomes from other memories, and therefore the more easily it can be located.³⁶ Further, the more it is related to other information in

³² Cutler et al., *supra* note 26, at 223.

³³ Mark T. Reinitz et al., *Role of Attention in Face Encoding*, 20 J. EXP. PSYCHOL. LEARN. MEM. & COGN. 161, 166-167 (1994).

³⁴ Schacter, *supra* note 2, at 182.

³⁵ Fergus I. M. Craik & Robert S. Lockhart, *Levels of Processing: A Framework for Memory Research*, 11 J. VERB. LEARN. & VERB. BEHAV. 671 (1972); Fergus I. M. Craik & Endel Tulving, *Depth of Processing and the Retention of Words in Episodic Memory*, 104 J. EXP. PSYCHOL. GEN. 268 (1975); Lars-Goran Nilsson & Ronald L. Cohen, *Enrichment and Generation in the Recall of Enacted and Non-Enacted Instructions*, in PRACTICAL ASPECTS OF MEMORY: CURRENT RESEARCH AND ISSUES VOL. 1: MEMORY IN EVERYDAY LIFE 427 (M.M. Gruneberg et al. eds., 1988); Daniel L. Schacter & S.M. McGlynn, *Implicit Memory: Effects of Elaboration Depend on Unitization*, 102 AM. J. PSYCHOL. 151 (1989).

³⁶ Henry C. Ellis, *Recent Developments in Human Memory*, 7 THE G. STANLEY HALL LECTURE SERIES 159 (B.P. Moksosky ed., 1987).

memory, the more associations it forms and therefore the more associative paths available to lead to retrieval.

a. Three Levels of Processing

Fergus Craik and Robert Lockhart³⁷ identified three levels of processing: sensory processing, intermediate processing, and deep processing. *Sensory* processing involves the encoding of the physical features of the information. *Intermediate* processing involves recognition and labeling of information. *Deep* processing involves semantic processing and assignment of meaning. It includes elaborative rehearsal (where repetition maintains new information in short-term memory longer, allowing greater opportunity for elaboration and entry into long-term memory), thinking about what is observed and its meaning/interpretation, and relating it to already stored knowledge. Deeper processing has been consistently shown to produce better memory. It is for this reason that recommendations for studying material for tests include thinking about it and relating it to one's life and experiences as a mnemonic device.

It is also for this reason that *organization* is such an excellent facilitator of memory. Students are routinely advised to outline material to study for tests. Material presented in an organized manner is encoded better.³⁸ It is more understandable and easier to encode at the deepest semantic level of processing. Further, memory works by association, and associations are easier among organized material. Finally, the *act* of organizing material (as in outlining study materials) creates better understanding and builds associative links.

b. "Absent-mindedness" and Shallow Processing

1. *Specificity of Encoding*

Among the hallmarks of shallow processing is lack of specificity in encoding. That is, when information is processed without adequate attention and elaboration, it tends to be encoded in terms of its "*gist*." Often, the "*gist*" will consist of a category label, such as "*talking*," "*having dinner*," "*running*," "*party*," "*man*," "*black man*," "*doctor*," etc. In this way, much of the detail is lost.

³⁷ Craik & Lockhart, *Levels of Processing*, *supra* note 35, at 671.

³⁸ Gordon H. Bower et al., *Hierarchical Retrieval Schemes in Recall of Categorical Word Lists*, 8 J. VERB. LEARN. & VERB. BEHAV. 323, 340-341 (1969); George Mandler, *Recognizing: The Judgment of Previous Occurrences*, 87 PSYCHOL. REV. 252 (1980).

Because little detail is encoded, features of a specific event, object or person that might otherwise allow the observer to distinguish it from a similar other are not encoded. Thus, when later asked to identify the specific person or object involved, or to describe the details of the event or actions, the observer cannot.

a. Cross Racial Identification

Failure in specificity of encoding is widely considered to be responsible for difficulties in cross-racial identification. We may simply engage in shallow categorical processing, attending to the person's race and not to individual facial features. We may also attend to the wrong features. Specific features we use to distinguish between members of our own race (such as hair and eye-color among Caucasians) do not succeed as well in distinguishing between members of another race (such as those whose members are characterized predominantly by dark hair and eyes). Thus, if we use the familiar strategies and encode those features, we will not successfully distinguish members of the other race.³⁹ Cross-racial identification is less difficult for those who spend more time with members of other races and thus learn to use the correct features.⁴⁰ For example, Dunning, Li, and Malpass⁴¹ showed that Caucasians, who are avid basketball fans, therefore having more exposure to African American faces, have less difficulty with cross-racial identification.

b. "Change Blindness"

One of the more interesting illustrations of the importance of the quality of attention, or depth and specificity in processing, is

³⁹ Robert K. Bothwell et al., *Cross-Racial Identification*, 15 PERS. SOC. PSYCHOL. BULL. 19 (1989); John C. Brigham & Roy S. Malpass, *The Role of Experience and Contact in the Recognition of Faces of Own-and Other-Race Persons*, 41 J. SOC. ISSUES 139, 142-143 (1985); D. Dunning et al., *Basketball Fandom and Cross-Race Identification Among European-Americans: Another Look at the Contact Hypothesis*, presented at the American Psychology-Law Society (Mar. 1998); Roy S. Malpass & Jerome Kravitz, *Recognition for Faces of Own and Other Race*, 13 J. PERS. & SOC. PSYCHOL. 330, 333 (1969); S.J. Platz & H.M. Hosch, *Cross Racial/Ethnic Eyewitness Identification: A Field Study*, 18 J. APPL. SOC. PSYCHOL. 972, 977 (1988).

⁴⁰ John C. Brigham et al., *Accuracy of Eyewitness Identifications in a Field Setting*, 42 J. PERS. & SOC. PSYCHOL. 673, 679 (1982); June E. Chance et al., *Recognition Memory for Infant Faces: An Analog of the Other-Race Effect*, 24 BULL. PSYCHOL. SOC. 257 (1986); Platz & Hosch, *supra* note 39, at 972.

⁴¹ Dunning et al., *supra* note 39.

the newly discovered phenomenon of “*change blindness*.”⁴² “*Change blindness*” refers to failure to detect changes in scenes or objects under continuous observation.

In one study,⁴³ for example, observers watched a movie in which an actor performed a simple action. Unknown to the observers, one actor was replaced by another during the course of the scene. Unbelievably, two thirds of the observers failed to notice the change.

In an even more incredible demonstration of the phenomenon, Daniel Simons and Daniel Levin⁴⁴ had a confederate on a college campus ask subjects for directions. While the two were conversing, the confederate was momentarily obscured by two men who walked between them holding a door. Behind the door, the confederate changed places with another, so that by the time the door passed, the subject was confronted with a different person who continued the conversation as if he was the original. Incredibly, less than half of the subjects noticed the change! The authors⁴⁵ suggested that change blindness might be explained by “*shallow encoding*” of the features of a scene or person, such that the “*gist*” of the scene is recorded without specific details. The “*gist*” of similar objects or the same object in a slightly different position or configuration is the same. Thus, detection of the difference between stimuli requires encoding of the features or details that distinguish one from another.

Change blindness with respect to people may be an unrecognized source of errors in eyewitness identifications. Imagine a convenience store robbery in which the witness has a clear opportunity to observe a man entering a store, but does not notice that a *different* man walks to the counter to rob the clerk. With a clear memory of the person he did observe clearly, the witness describes him to the police and later identifies that person as the perpetrator of the robbery. In fact, some laboratory evidence exists for this phenomenon.⁴⁶ The authors found that

⁴² D.T. Levin & D.J. Simons, *Failure to Detect Changes to Attended Objects in Motion Pictures*, 4 PSYCHOL. BULL. REV. 501 (1997).

⁴³ See *id.*

⁴⁴ Daniel J. Simons & Daniel T. Levin, *Failure to Detect Changes to People During a Real-World Interaction*, 4 PSYCHOL. BULL. REV. 644 (1998).

⁴⁵ See *id.*; see also Daniel J. Simons & Daniel T. Levin, *Change Blindness*, 1 TRENDS IN COGN. SCI. 261 (1997).

⁴⁶ David F. Ross et al., *Unconscious Transference and Mistaken Identity: When a Witness Misidentifies a Familiar but Innocent Person*, 79 J. APPL. PSYCHOL. 918, 929 (1994).

many witnesses to an assault confused the assailant and the bystander, thinking that they were the same person.

Change blindness may also provide an explanation for various aviation, vehicular, or industrial accidents. A pilot may fail to perceive crucial changes in gauges; a driver may fail to perceive changes in location or motion of other vehicles; or a factory worker may fail to perceive indications of danger on devices he or she monitors for warning of trouble. Further, genuine lack of awareness of such changes may be the basis of honest false testimony. If these actors fail to notice crucial changes, they will later honestly, but falsely, report that the changes did not occur, thus misleading juries regarding the true causes of and responsibility for accidents.

The change blindness phenomenon provides a clear illustration of the general principle that in order to later accurately identify or describe a particular person or object (or to distinguish one from another), one must attend to and encode the features that distinguish the one in question from similar others. Thus, if one attends only to the *category* of the object, rather than its individual features, or if one attends to the *wrong* features (i.e., those that do not distinguish the particular object from others in its category), one will later be unable to identify the individual.

2. *Did I Remember to Lock the Door? Consequences of Automatic vs. Controlled Processing*

Many of the activities we perform in daily life are routine, effortless, and do not require the focused attention and deep processing necessary to form long-term memories. Things we tend to do on "*automatic pilot*," to put it colloquially, are done by means of what is called "*automatic processing*"⁴⁷ in information processing terms. When we are in the automatic processing mode, we pay minimal attention and may accomplish things while devoting focal attention to something else.

Activities that form a regular morning routine, such as brushing teeth, taking pills, getting ready to go, locking the doors, and even driving to work are often done in automatic processing mode. This is why, for example, we often cannot remember whether we took a pill, fed the cat, or locked the door. If we do

⁴⁷ Johnathon A. Bargh, *Automatic Information Processing: Implications for Communication and Affect*, in COMMUNICATION, SOCIAL COGNITION, AND AFFECT 9 (L. Dohew et al. eds., 1988).

remember that we did these things, it is unlikely that we also remember the doing of them, as in the sense of having an internal video of exactly what we did.

Driving is also accomplished in automatic mode much of the time. We listen to the radio, talk to other passengers, and pay only minimal attention to the physical task of driving. In fact, if we shifted to controlled processing mode, where each action is placed in focal attention, and thought about it in depth, we would experience difficulty driving, much like a beginning driver who gets behind the wheel for the first time.

Automatic processing mode is necessary to accomplish everyday activities smoothly and efficiently without too many demands on limited processing capacity. The side effect of this efficiency, however, is loss of memory. How many of us have been stopped by a traffic cop only to wonder what our offense might have been? Then when confronted with having run a stop sign, how many of us could not remember how completely we stopped, or even whether the stop sign was there?

Memory for routine behaviors often becomes crucial in court. When putting the plane's engine back together, did the mechanic put a particular filter in place correctly? Was the door locked? Did you recall seeing your husband that morning? Did you warn this particular patient about the risks of the procedure? Often, the issue is whether a professional did or did not perform, in a specific instance, what they usually do perform in the typical instance. Inherently, reports of such behaviors are unreliable.

Because routine activities are often done in automatic processing mode, they are not encoded elaboratively, in a way that would facilitate long-term memory. When these activities later become an issue in court, the witness will often be unable to accurately report on their behavior. Instead, (s)he will tend to base the report on a memory *constructed* (see section on constructive processes below) from the assumption that they *would have* done it that way because that is how they usually do it. For example, we cannot truly remember each physical act involved in driving, even though we know what we did. We must have, or we would not have gotten to work!

3. *Attention/Processing Capacity is Limited, and Therefore Selective*

The amount of information in the environment exceeds the limits of our attentional resources, a situation that forces attention to selectively focus on some features of the situation and to

neglect others. Predictably, certain kinds of people, objects and events tend to selectively draw attention and to compromise attention to other features of the situation in the process.

a. Salient Features

Some things draw attention by their very nature, such as those that are loud, colorful, dramatic, exciting, or central to the action. Recall the standard techniques for “*creating a diversion*” among TV criminals or private detectives designed to draw attention away from the person who wants to sneak in or snatch something unobserved.

b. Threatening Features

Situations or objects that are personally threatening tend to draw attention. For example, investigations of the presence of a weapon during a crime have demonstrated that the weapon tends to attract the attention of the witness, leaving less attention to the perpetrator’s facial and physical characteristics. This phenomenon is often referred to as “*weapon focus*.” Nancy Steblay performed a meta-analysis of weapon focus studies, showing a reliable decrement in recognition accuracy for the perpetrator when a weapon is present as opposed to when one is not.⁴⁸

c. Distinctive Features

We have all heard references to the idea of “*sticking out like a sore thumb*,” illustrating the idea that attention is drawn to things that are distinctive or different. In turn, those features are more likely to be remembered than less distinctive or noticeable aspects of the scene.

Distinctiveness is also the basis on which we distinguish one object from similar others. Attention tends to go to the distinguishing features of a person, hence the importance, should one want to commit a criminal act, of looking and dressing in the least distinct manner possible.

The use of distinctiveness to differentiate between people is widely considered to contribute to the difficulty in cross-racial identification,⁴⁹ as noted earlier.

⁴⁸ Nancy M. Steblay, *A Meta-Analytic Review of the Weapon Focus Effect*, 16 LAW & HUM. BEHAV. 413 (1992).

⁴⁹ Bothwell et al., *supra* note 39, at 19; Brigham & Malpass, *supra* note 39, at 139; Malpass & Kravitz, *supra* note 39, at 330; Platz & Hosch, *supra* note 39, at 972.

d. Features Relevant to Personal Interests, Goals, or Current Concerns

Rachel Remen, in her book *Kitchen Table Wisdom*, tells of a time when she was in medical school, riding the subway to see her parents: "*I remember traveling home to visit my parents on the subway, realizing only after a while that I had been unconsciously scanning the veins of the bare-armed people around me, wondering whether my skills with a needle were good enough to allow me to successfully draw blood from them.*"⁵⁰ Attention is naturally drawn to things relevant to one's own personal interests, goals, or current concerns, just as her attention was drawn to veins as she was being trained to draw blood. When planning to buy a car, for example, one tends to notice different makes and models in parking lots, car ads on TV, and other relevant information where it is encountered. If cars are not of concern, such information is either not noticed at all or not deeply processed. The world is generally filtered through the lens of our own interests and needs.

Imagine, as suggested by S.T. Fiske and S.E. Taylor,⁵¹ that you walked through a house with the eye of a burglar casing the house for entry and loot. Would you notice and remember the same things as if you walked through as a potential buyer of the house, or as the police investigating the burglary? Attention research has shown that memory will be best for features relevant to the burglary, the crime investigation, or to the purchase decision, depending upon the observer's intentions.

e. Features Relevant to Activated Schemas, Stereotypes, and Expectations

*"Labeling sets up an expectation of life that is often so compelling we can no longer see things as they really are. . . . We are in a relationship with our expectations and not with life itself."*⁵²

"Schemas" provide the basis of our understanding of the world around us. They include social category schemas (or stereotypes), event schemas (telling us what tends to happen and who tends to be involved in particular event categories), causal schemas (telling us what tends to cause particular events or outcomes), person schemas (telling us what a particular person is

⁵⁰ RACHAEL N. REMEN, *KITCHEN TABLE WISDOM: STORIES THAT HEAL* XXV (1996).

⁵¹ S.T. FISKE & S.E. TAYLOR, *SOCIAL COGNITION* (2d ed. 1991).

⁵² REMEN, *supra* note 50, at 66.

like and how (s)he is likely to behave), and self schemas (our own beliefs about ourselves), among others.

Research in cognitive and social psychology has shown that the influence of schemas on information processing is pervasive. They allow us to recognize objects, people, procedures, social situations, and much more. They form the basis of expectations that tell us what to do with a person or object or, in a particular situation, what to expect to happen. They offer the standards against which we evaluate specific individuals or events. Finally, they direct attention to schema relevant features of what we observe and direct interpretation of what we see.

A particular schema may become active in any number of ways. For example, the social category of "*criminal*" may become salient to an observer because the target was identified as a criminal by another observer (labeling), because the target "*looked*" suspicious, because the observer is a policeman and deals with criminals every day, or because the observer had just seen a television show about crime.

Once a schema is activated, it has very predictable consequences for attention and information processing. Among them is the tendency for attention to selectively focus on *schema-relevant* aspects of the situation the observer is in and later to selectively remember that information.⁵³ Further, memory for information *consistent* with expectations generated by the schema is better in most circumstances than memory for information that is *inconsistent* with them. Incongruent information can be remembered as well as, or better than, consistent information under limited circumstances. When the observer is highly motivated to perceive things accurately *at the time* an event or information is first encountered, incongruent information may be processed carefully in an effort to understand it. This increased depth of processing, in turn, will facilitate encoding and memory. In the absence of such motivation, incongruent information tends to be ignored.⁵⁴

⁵³ Reid Hastie, *Schematic Principles in Human Memory*, in SOCIAL COGNITION: THE ONTARIO SYMPOSIUM 1 (E.T. Higgins et al. eds., 1981); FISKE & TAYLOR, *supra* note 51, at 242; ZIVA KUNDA, SOCIAL COGNITION: MAKING SENSE OF PEOPLE 104 (1999).

⁵⁴ Charles Stangor & David McMillan, *Memory for Expectancy-Congruent and Expectancy-Incongruent Information: A Review of the Social and Social Developmental Literatures*, 111 PSYCHOL. BULL. 42, 58 (1992).

f. Memory for the “Core” of the Event is Superior

Attention tends to be drawn to what may be thought of as the “core” of the event. Thus, memory for the nature of the event and the central actors and actions tends to be superior to that for peripheral details. This holds true for both stressful/traumatic and non-stressful events and for observers or victims of all ages (*see* section IV.B.4(b)(2) *infra* on trauma and memory).

Interestingly, observers often assume that witnesses who can provide great detail concerning peripheral aspects of an event will be more accurate regarding central detail. However, just the opposite tends to be true. Gary Wells and Michael Leippe,⁵⁵ for example, reported a negative correlation between the ability to recognize a perpetrator and the ability to recall peripheral details. Subjects in their experiment observed a man steal a calculator. Later, those who remembered details about the room in which the theft took place were less likely to accurately identify the perpetrator.

Unfortunately, jurors’ common sense understanding of the relationship of memory for central detail versus peripheral detail is diametrically opposed to the actual relationship. Jurors tend to believe that failure to accurately remember peripheral details casts doubt on a witness’s accuracy for central actions, persons, or events. However, exactly the opposite is true. Good memory for peripheral details would suggest that the witness’s attention was directed away from the core event at the time it was witnessed, and that memory for core details may be compromised.

4. *Attention is Vulnerable*

Try as we may to focus our attention undisturbed, it is nevertheless vulnerable to distraction by both internal and external forces.

a. Distraction

1. *Complexity*

Attention may be compromised by event “complexity.” The more demands for attention there are, the less attention is available for any specific feature of the event. The events of, and leading up to, airplane crashes are perfect examples of complex events.

⁵⁵ Wells & Leippe, *supra* note 13, at 682.

Passengers in a commercial jet, for example, may be confronted with unexpected physical events such as jolts, changes in altitude, announcements and direct interactions with the crew and other passengers, severed parts of the plane, fire, decompression (many occurring simultaneously), and ultimately the crash and its aftermath. The crew must attend to the physical events noticeable to passengers, as well as gauges and crucial readings and must attempt to fix or compensate for mechanical problems. Additionally they must manage the plane and communications with both ground crews and flight attendants. The flight attendants must attend to physical events with the plane, the passengers and their needs, and liaison communications between crew and passengers. Ground crews, in turn, must manage not only the flight in danger, but also others that may be affected. Thus, everyone involved is confronted with a rapidly unfolding complex event with many divergent demands on their attention—a situation that continues unabated for those who survive and confront the aftermath. Under such circumstances, attention to the details of the event, as well as the depth of processing of those details, will be compromised through several processes.

First, the necessity of attending to so many different details of the event, per se, reduces not only the *likelihood* of attending at all to a given detail, but also the *amount of time* one can attend to it and consolidate it to memory.

As noted earlier, memory is dependent upon attention. The less attention devoted to a particular aspect of the event, the less well it will be remembered later. In our plane crash example, there are so many diverse things to attend to that attention is necessarily divided, forcing the witness both to fail to witness some details at all, and, among those they do witness, to devote less time to each. Thus, on the average, memory for any given aspect of a complex event will be: (a) less likely to exist at all, and if it does, (b) less clear and accurate than for the same aspect had it been part of a simpler event.

This point has been demonstrated in the eyewitness identification literature. There, research has shown that as the complexity of a criminal event increases (e.g., more bystanders, more perpetrators, the use of weapons, other events occurring simultaneously with the crime, a more complex environment), descriptions of and memory for any given detail, including the

perpetrator, will decrease in detail and accuracy.⁵⁶ Brian Clifford and Clive Hollin also found that the effects of complexity were greater at higher levels of event violence, probably due to greater emotional arousal in the witness.⁵⁷ This finding is consistent with the notion that the stress and trauma of an airplane crash would similarly exacerbate the negative impact of event complexity on memory.

a. The Issue of Ambiguity

Related to the issue of complexity is the issue of ambiguity. That is, complexity itself can sometimes render what one is witnessing ambiguous. This is in part because the necessity of dividing attention between a number of different people, actions, and events makes it impossible to track each of them as carefully. Thus, one may be unable to know for certain what is going on with everything or everyone at all times (especially if they are in disparate locations).

Studies of social influence have demonstrated that people are more susceptible to persuasion or influence by others if they are uncertain of their own perceptions or opinions. Thus, the complexity of the situation in which events take place, combined with conditions of the witness that may compromise attention, such as intoxication, extreme stress, trauma, etc., may create less clear perceptions. In turn, this ambiguity of perception may give rise to the potential for greater contamination of both their perceptions of the events as they occurred and of their subsequent memories of the events. For more information, see our discussion of witness contamination below.

2. *Proactive and Retroactive Interference*

Memory is further compromised by “*interference*” processes resulting from a rapid overlapping sequence of events. These processes are similar to those preventing us from remembering jokes heard as part of a sequence of many. We can remember a particular joke better when it is the only one heard that day than when it is one of many in a rapid sequence of jokes. Those of us

⁵⁶ Robert K. Bothwell, *Trait Anxiety and Facial Recognition* (1991) (unpublished manuscript); Brian R. Clifford & Clive R. Hollin, *Effects of Type of Incident and the Number of Perpetrators on Eyewitness Memory*, 66 J. APPL. PSYCHOL. 364 (1981); Sporer, *supra* note 26, at 183; Steblay, *supra* note 48, at 413; P.M. WALL, EYEWITNESS IDENTIFICATION IN CRIMINAL CASES (1965).

⁵⁷ Clifford & Hollin, *supra* note 56, at 364.

who are older may recall that we remembered everyday events better when there were not so many to remember (back when our lives were less complex). Similarly, students can remember exam materials for a particular class better if that material was not preceded or followed by studying for other exams.

This problem has been documented extensively in the memory literature, where it has been shown repeatedly that memory for information is better when it is learned (encountered) in isolation. When either preceded ("*proactive interference*") or followed ("*retroactive interference*") by other information, the target information is remembered more poorly.⁵⁸ Interference from prior or subsequent additional information or events interferes with the ability to consolidate and transfer the target information from short into long-term memory.

These interference processes are one reason (other than advancing senility) why the rapidly sequenced events of a complex life can lead us to forget some things as fast as they happen. Similarly, a rapidly unfolding airplane crash involving multiple overlapping events permits neither adequate attention to given details nor time for processing, elaboration, and consolidation or storage in long-term memory.

b. Witness Factors Disrupting Attention

Clearly, external forces may disrupt attention. Internal forces, however, may sometimes be even more disruptive.

1. Intoxication

Intoxication from either alcohol or other drugs can severely impair attention and, later, memory.⁵⁹ Further, there is some evidence that later recall is better when again intoxicated than when sober, a phenomenon called "*state-dependent retrieval*."⁶⁰

2. Trauma and Stress

Among the hallmarks of aviation disasters are strong emotion, trauma, and stress among all involved, from victims and their

⁵⁸ Wayne A. Wickelgren, *Single-Trace Fragility Theory of Memory Dynamics*, 2 MEM. & COGN., 775-780 (1974).

⁵⁹ Stephen A. Lisman, *Alcoholic "Blackout": State Dependent Learning*, 30 ARCH. GEN. PSYCHIATRY 46 (1974).

⁶⁰ Eric Eich, *Theoretical Issues in State Dependent Memory*, in VARIETIES OF MEMORY AND CONSCIOUSNESS: ESSAYS IN HONOUR OF ENDEL TULVING 331, 332 (Henry L. Roediger III & Fergus I. M. Craik eds., 1989).

families to ground personnel, rescue workers, and investigators. Many assume that memories for trauma are more accurate and more durable over time than those for any other events; that is, they are “*burned-in*” and indelible. The true picture, however, is much more complicated.

Memory research has addressed memory for stressful or traumatic events at two levels. First, laboratory studies have assessed memory for events or other materials varying in violence or ability to create strong emotions. This research has enabled researchers to examine basic attentional processes engaged by violent, arousing, or stressful material. However, ethical constraints prevent laboratory examinations of extreme personal trauma. Thus, the second level of research has attempted to examine memory for personally traumatic events primarily through non-experimental methods. Our discussion of emotions and memory will first examine principles developed in laboratory research and then turn to the application of these principles in studies of memory for real life traumatic events.

a. “*Tunnel Memory*”

Sven-Ake Christianson and his colleagues have suggested a three-stage process by which stress or arousal affects memory.⁶¹ First, in the “*pre-attentive*” stage, emotion-eliciting stimuli, such as blood or personal threat, trigger an orienting response drawing attention to the emotion-eliciting stimuli. Then, in the second stage, active attentional mechanisms engage elaborative encoding focused on the emotional material. This selective attention and elaboration limits processing capacity for peripheral information not central to the emotional aspects of the event. In cases of very strong emotion, the person may become preoccupied by intrusive thoughts regarding the threatening event, further narrowing the focus of attention/processing.

The authors refer to the outcome of the narrowed attention and heightened psychological focus on the source of the emotional arousal as “*tunnel memory*.”⁶² Events witnessed under this narrow processing mode will tend to promote *better* memory for *central* information—the details of the emotion provoking part

⁶¹ Sven-Ake Christianson & Martin A. Safer, *Emotional Events and Emotions in Autobiographical Memories*, in REMEMBERING OUR PAST: STUDIES IN AUTOBIOGRAPHICAL MEMORY 218 (D.C. Rubin ed., 1996); Martin A. Safer et al., *Tunnel Memory for Traumatic Events*, 12 APPL. COGN. PSYCHOL. 99 (1993).

⁶² Safer et al., *supra* note 61, at 99.

of the event. In contrast, it will tend to inhibit processing of and memory for *peripheral details*—details that are either irrelevant or spatially peripheral to the core source of arousal. A number of studies have supported this conclusion.⁶³

Memory also tends to be better for details that are spatially or temporally associated with the main characters (or source of emotion) for highly arousing events than for less arousing events, but better for peripheral details in less emotional events than in emotional events. In part, this tendency may result from the tendency for memory to be more focused spatially for traumatic scenes than for either the actual scene or an equally large, but non-emotional scene. The narrow focus of attention seems to narrow the subjective range of perception. In contrast, subjects tend to remember more neutral scenes as more wide-angled than they actually were.⁶⁴

Finally, in contrast to memory for most things, memory for highly emotional or traumatic events can sometimes become *better* over time and with repeated questioning. As arousal and anxiety fades, all aspects of information processing become easier, including efforts to remember. Thus, it is not unusual to find a victim or witness who at first is unable to fully describe what happened, but is able to later provide much richer and coherent reports.⁶⁵ It is vitally important to consider, however, the nature of post-event influences that may have contaminated the witness's memory. Memory may improve if left to itself, but may become seriously distorted if the person is subjected to biasing interviews or techniques for memory retrieval (*see* Section VII *infra*).

i. How Do We Know What Attention Will Narrow to in a Witness Under Stress?

Although there appears to be solid evidence that memory for events that become the narrow focus of attention under stress will be enhanced and memory for peripheral details will be di-

⁶³ Sven-Ake Christianson, *Emotional Stress and Eyewitness Memory: A Critical Review*, 112 PSYCHOL. BULL. 284 (1992); Christianson & Safer, *supra* note 61, at 218; F. Heuer & D. Reisberg, *Emotion, Arousal, and Memory for Detail*, in THE HANDBOOK OF EMOTION AND MEMORY: RESEARCH AND THEORY 151 (S.A. Christianson ed., 1992).

⁶⁴ Helene Intraub et al., *Looking at Pictures but Remembering Scenes*, 18 J. EXP. PSYCHOL. LEARN. MEM. COGN. 180 (1992).

⁶⁵ Christianson & Safer, *supra* note 61, at 218.

minished, the difficulty is identifying *exactly what* becomes the focus of narrowed attention.

Many of the laboratory studies on this topic have identified the central characters in violent or stressful scenes as the probable focus of attention. In practice, however, it is much more difficult to predict.

A. Reduction in Eyewitness Identification Accuracy Under Stress

This problem has been identified in the eyewitness identification literature, which has shown that memory for the perpetrator of a violent action will not always be enhanced by the emotion caused by the violence. When a perpetrator uses a weapon, for example, the eyewitness's ability to later identify the perpetrator is reduced⁶⁶ because attention goes to the weapon.

Some studies have examined general effects of arousal by exposing witnesses to events that vary in either: (a) the degree of violence involved in an event or (b) the intensity of personal threat involved. In many such studies, higher arousal levels (as created by violence or personal threat) have resulted in reduced eyewitness accuracy for certain characteristics of the event.⁶⁷

One study is worth describing in more detail. Douglas Peters⁶⁸ had witnesses provide physical descriptions and identifications from photo lineups of a nurse who had recently inoculated them at an immunization clinic, and of a second person who

⁶⁶ Steblay, *supra* note 48, at 413.

⁶⁷ Robert K. Bothwell et al., *An Exploratory Study of Personality Differences in Eyewitness Memory*, 2 J. SOC. BEHAV. PERS. 335 (1987); Robert K. Bothwell & H.M. Hosch, Effects of Realistic Arousal Levels on Identification Accuracy of Bystanders (unpublished data, on file with the University of Texas at El Paso) (1987); John C. Brigham et al., *The Effect of Arousal on Facial Recognition*, 4 BAS. APPL. SOC. PSYCHOL. 279 (1983); Sven-Ake Christianson & Elizabeth F. Loftus, *Memory for Traumatic Events*, 1 APPL. COGN. PSYCHOL. 225 (1987); Clifford & Hollin, *supra* note 56, at 364; C. Johnson & B. Scott, The Effects of Arousal on the Cognitive Processing of Information in an Eyewitness Setting (unpublished work, on file with Oklahoma State University) (1975); C. Johnson & B. Scott, Eyewitness Testimony and Suspect Identification as a Function of Arousal, Sex of Witness, and Scheduling of Interrogation, presented at the American Psychological Association (Aug. 1976); Saul M. Kassir, *Eyewitness Identification: Victims Versus Bystanders*, 14 J. APPL. SOC. PSYCHOL. 519 (1984); Elizabeth F. Loftus & Terrence E. Burns, *Mental Shock Can Produce Retrograde Amnesia*, 10 MEM. & COGN. 318 (1982); Douglas P. Peters, *Eyewitness Memory and Arousal in a Natural Setting*, in PRACTICAL ASPECTS OF MEMORY: CURRENT RESEARCH AND ISSUES VOL. I: MEMORY IN EVERYDAY LIFE 89 (M.M. Gruneberg et al. eds., 1988).

⁶⁸ Peters, *supra* note 67, at 89.

had taken their pulse two minutes later. The researchers had measured actual physiological arousal in subjects during both events.

Arousal was higher (as one might expect) during the inoculation (88 beats per minute), as compared to the pulse measurement (71 beats per minute).⁶⁹ Further, even though the two targets were equally memorable, physical descriptions of the nurse were less accurate as compared to those of the pulse taker. Witnesses also identified the nurse in target-present lineups at a much lower rate than the pulse taker (41% versus 66%).⁷⁰

Thus far, the results were similar to many of the studies cited above. Peters, however, also included an analysis of the relationship between individual arousal and identification accuracy. The most physiologically reactive witnesses (an average elevation of 39 beats per minute at inoculation as compared with pulse measurement) showed a considerably lower rate of correct identification of the nurse (31%) than did the least physiologically reactive witnesses (59%), whose pulse elevation during inoculation averaged 2.8 beats per minute.⁷¹ Thus, the results indicate that regardless of the objective arousal potential of the events with which a witness is confronted, later identification accuracy is strongly predicted by the witness's own arousal level during the event.

It is also important to note that extreme arousal at any time, whether during encoding, storage or retrieval, debilitates information processing. To understand its effects during retrieval, for example, consider the case of test-taking anxiety (which plagues many students). Students suffering from test-taking anxiety may know the material very well, but nevertheless, do very poorly on the test because their anxiety does not permit them to retrieve the material from memory (usually until just after they leave the testing situation and their anxiety drops).

B. The Role of Individual Differences in Anxiety/Arousal

Consistent with Peters' individual difference approach, Robert Bothwell⁷² found that the debilitating effect of potentially arousing external events depends upon the neuroticism level of the witness (which is associated with chronic anxiety). They

⁶⁹ *Id.* at 92.

⁷⁰ *Id.*

⁷¹ *Id.* at 94.

⁷² Bothwell et al., *supra* note 67, at 335.

found that subjects high in neuroticism (high in the tendency to interpret stimuli as personally threatening) were particularly debilitated by potentially arousing external events.⁷³ The accuracy of their perpetrator identifications decreased as the arousal potential of the witnessed events increased.

High levels of either acute or chronic anxiety can affect memory in the same manner as heightened fear, stress, or emotion. Anxiety generally interferes with information processing, as illustrated in the test-taking example above. It will interfere with attention and elaboration and thus, impair encoding; and later, it will interfere with retrieval. Two studies, for example, showed poorer eyewitness accuracy among witnesses high in anxiety and/or self-preoccupation.⁷⁴ Further, anxiety appears to narrow the focus of attention in much the same manner as other sources of arousal or threat.⁷⁵

C. The Importance of Self-Focus

Clearly, attention did not narrow to the perpetrators in the above examples. Instead, attention to the perpetrator (whom one might have predicted to become the central focus of attention) was compromised. Where then, did attention go?

In many cases, attention turns inward in response to stress. The person may focus on thoughts of dying or on trying not to panic. Thoughts may go to loved ones also in danger or to God and worry over whether (s)he is or is not headed to heaven in the event of disaster. The possibilities are many, and while one person may focus on the central actors and action, others may focus on their own feelings or those of companions around them.

For this reason, when trying to assess the potential for error in a witness' testimony one should always ask the witness what he or she was thinking about and feeling during the incident. A witness who reports that (s)he primarily focused on concern for

⁷³ *Id.*

⁷⁴ Judith M. Siegel & Elizabeth F. Loftus, *Impact of Anxiety and Life Stress Upon Eyewitness Testimony*, 12 BULL. PSYCHOL. SOC'Y 479, 480 (1978); Matthew Dobson & Roslyn Markham, *Individual Differences in Anxiety Level and Eyewitness Memory*, 119 J. GEN. PSYCHOL. 343, 348 (1992).

⁷⁵ Michael W. Eysenck & Karin Mogg, *Clinical Anxiety, Trait Anxiety, and Memory Bias*, in THE HANDBOOK OF EMOTION AND MEMORY: RESEARCH AND THEORY 429 (S.A. Christianson ed., 1992); Thomas H. Kramer et al., *Weapon Focus, Arousal, and Eyewitness Memory: Attention Must Be Paid*, 14 LAW & HUM. BEHAV. 167, 167-69 (1990).

children, for example, would be expected to remember the children and their reactions far better than other features that might objectively be more central to the event.

b. Real-Life Trauma and Memory

Studies of memory for real-life traumatic events have fallen into two categories: (1) those involving highly emotional and significant but non-personal events, such as the Challenger explosion, assassination or death of public figures, and so on; and (2) those involving personal trauma, such as sexual abuse or assault, violent crime, or death of loved ones.

i. "Flashbulb" Memories for Shocking Public Events

Roger Brown and James Kulick⁷⁶ coined the term "*flashbulb memories*" to refer to recollections of novel and shocking events. The authors proposed a mechanism called "*Now Print!*" through which the brain acts like a camera flashbulb to "*freeze*" the memory of the moment when we learn of the shocking event.⁷⁷ To examine this phenomenon, researchers have studied memories of highly publicized and shocking public events such as the Kennedy assassination, the Challenger explosion, the Martin Luther King assassination and others. Participants are considered to have a "*flashbulb memory*" of the event if they report vivid memories of where they were and with whom at the time they learned of the event, and how they learned of it. Research on the flashbulb memory phenomenon has generally shown the following.

First, most people remember shocking public events during their lifetimes. For example, Brown and Kulick found that all but one of eighty adults interviewed in 1976 possessed flashbulb memories of the Kennedy assassination.⁷⁸

Second, flashbulb memories are more likely for public events that are personally significant. This is reflected in greater flashbulb memory for the King assassination among blacks than among whites, for Margaret Thatcher's resignation among British than among Americans, and for the Loma Prieta earthquake near San Francisco among those affected by it than those not

⁷⁶ Roger Brown & James Kulick, *Flashbulb Memories*, 5 COGN. PSYCHOL. 73 (1977).

⁷⁷ See *id.*

⁷⁸ See *id.*

affected.⁷⁹ Even among those to whom the event is significant, those experiencing greater emotional arousal upon hearing of it experience greater flashbulb memories.

Third, flashbulb memories are subjectively detailed, vivid and compelling.

Fourth, as with other emotional events, the central subject of flashbulb memories is clearly well remembered over very long periods of time. People remember that the shocking event did happen. But how well do they remember the peripheral detail, i.e., where they were when they learned of it, who they were with, how they learned of it, etc.?

Despite the subjectively compelling nature of flashbulb memories for these details, they can be quite inaccurate in some respects. Researchers study accuracy by interviewing people both immediately after a shocking public event and again months or years later. This research has indicated that memory for shocking emotional events is superior to that for more mundane events. Like memory for mundane events, however, memory for shocking events does decline over time. Further, memory for the peripheral details of where, when, with whom, etc. can become quite inaccurate over time, even as the person maintains great confidence in its accuracy.⁸⁰

The results of studies of memory for shocking, emotional, and personally significant public events are generally consistent with laboratory studies of memory for emotional events. People are more likely to remember emotionally significant material and events. However, while memory is better for the central facts to which attention is drawn, it may be lacking or inaccurate for peripheral details. But what about memory for traumatic *personal* events?

ii. *Memory for Personal Trauma*

Substantial controversy exists among psychologists over the issue of how, if at all, memory for traumatic personal events is different from memory for less emotional events. Are such memories significantly more vivid, durable, and resistant to distortion? Do they engage different biochemical processes or brain mechanisms? Are they subject to repression and later sud-

⁷⁹ MARTIN A. CONWAY, FLASHBULB MEMORIES (1995); SCHACTER, *supra* note 2, at 195.

⁸⁰ SCHACTER, *supra* note 2, at 195.

den recovery? Are they more or less susceptible to distortion through investigative interviews or memory retrieval aids?

Research on memory for traumatic personal events has revealed both similarities and differences to memory for mundane events.

A. Trauma and Persistence

First, consistent with the laboratory studies of emotional event, and studies of flashbulb memories, case studies of real-life tramata ranging from Holocaust survivors and war veterans to childhood tramata such as kidnapping or sexual abuse have shown that memories for these tramata are more likely to persist over time than memory for other events.⁸¹ In fact, Daniel Schacter⁸² suggested that "*persistence*," the seventh sin of memory, is particularly characteristic of memory for traumatic events. "*Persistence*" refers to intrusive recollections that one would prefer to forget but cannot.

Memories for most traumatic events are both persistent and intrusive. Strategies to avoid or suppress the memories fail to affect either the frequency or power of intrusive images and thoughts.⁸³ In fact, the persistence and intrusiveness of memories for traumatic events, and the interference with work and family life that result, can become part of a claim for damages in civil actions resulting from traumatic accidents.

B. Psychogenic Amnesia

Although memory for traumatic events is, more often than not, both persistent and intrusive, psychological trauma can temporarily create the exact opposite reaction. "*Psychogenic amnesia*" refers to loss of memory caused by psychological trauma. Amnesia following psychological trauma has been documented in the clinical psychology literature for well over a century. Patients may experience either very broad scale psychogenic amnesia, involving loss of most or all of their personal past, or very specific amnesia for some or all aspects of the traumatic event itself. At the broadest extreme, the victim may enter what is

⁸¹ *Id.* at 201.

⁸² Schacter, *supra* note 2, at 195-196.

⁸³ Wilma Koutstaal & Daniel L. Schacter, *Intentional Forgetting and Voluntary Thought Suppression: Two Potential Methods or Coping with Childhood Trauma*, in 16 *REVIEW OF PSYCHIATRY* 79 (L.J. Dickstein et al. eds., 1997); SCHACTER, *supra* note 2, at 201; Schacter, *supra* note 2, at 195-196.

called a "fugue state" where (s)he has lost all sense of personal identity without realizing it. At the narrow extreme, memory loss may be very selective, even as narrow as selected components of the traumatic event.

Psychogenic amnesias tend to be temporary, often serving as a temporary escape from an intolerable situation. Typically, the victim will recover his or her entire personal past with the exception of what happened during fugue.

Claims of amnesia occur in both victims and perpetrators of trauma. Claims of limited amnesia, for example, are common among perpetrators of violent crime. Research on violent criminals has found perpetrator claims of amnesia for the crime ranging between 25% and 65%.⁸⁴ Clearly, some claims of amnesia among criminal defendants may be regarded as false. However, such claims tend to be associated with alcohol or drug use, and thus may reflect true loss of memory. Schacter⁸⁵ argues that most cases of limited amnesia involve intoxication, head injury, or loss of consciousness during the trauma. For this reason, clear evidence that memory loss is caused by psychological trauma itself is lacking.

Claims of lost memories are common among victims, particularly those of sexual abuse. Although there is general agreement that any memory may be lost, including those of traumatic events, disagreement exists concerning the mechanisms of forgetting. Amnesia may occur either because of special defense mechanisms such as repression or dissociation,⁸⁶ or because of normal memory processes such as decay, interference, inhibition, or intentional or unintentional failure to rehearse the event.⁸⁷

⁸⁴ Judith Lewis Herman, *Crime and Memory*, 23 BULL. AM. ACAD. OF PSYCHIATRY & LAW 5 (1995); John F. Kihlstrom & Daniel L. Schacter, *Functional Disorders of Autobiographical Memory*, in HANDBOOK OF MEMORY DISORDERS 337 (A. Baddeley et al. eds., 1995); Daniel L. Schacter, *Amnesia and Crime: How Much Do We Really Know?* 41 AM. PSYCHOL. 286 (1986); SCHACTER, *supra* note 2, at 218; David Spiegel, *Hypnosis and Suggestion*, in MEMORY DISTORTION: HOW MINDS, BRAINS, AND SOCIETIES RECONSTRUCT THE PAST 129 (Daniel L. Schacter ed., 1995).

⁸⁵ SCHACTER, *supra* note 2, at 218.

⁸⁶ Lucy Berliner & Linda Meyer Williams, *Memories of Child Sexual Abuse: A Response to Lindsay and Read*, 8 APPL. COGN. PSYCHOL. 379 (1994); John Briere & Jon R. Conte, *Self-Reported Amnesia for Abuse in Adults Molested as Children*, 6 J. TRAUMA. STRESS 21 (1993); JUDITH L. HERMAN, *TRAUMA AND RECOVERY* (1992); Judith L. Herman & Emily Schatzow, *Recovery and Verification of Memories of Childhood Sexual Trauma*, 4 PSYCHOANAL. PSYCHOL. 1 (1987).

⁸⁷ D. Stephen Lindsay & J. Don Read, *Psychotherapy and Memories of Childhood Sexual Abuse: A Cognitive Perspective*, 8 APPL. COGN. PSYCHOL. 281 (1994); Peter A.

C. Traumatic Memory and Distortion

Although there may be room for debate over the relative susceptibility of memory for traumatic events to distortion, there can be no question that such memories are not “burned in” precise recordings, impervious to distortion. Instead, memories for traumatic events may be severely distorted and even fabricated completely.

As noted earlier, traumatic or emotional memories are less likely to fade over time and, on average, tend to be more accurate regarding central but not necessarily peripheral details. They are, however, nevertheless susceptible to distortion through the same mechanisms as more mundane memories. These mechanisms will be discussed in some detail in the section below on biasing aids to memory retrieval. Here, however, we will provide a few salient examples from studies of real life trauma that illustrate the extent to which memory for traumatic events can be distorted.

Several studies of children’s memories for real-life trauma have illustrated this potential for distortion. Lenore Terr,⁸⁸ for example, studied the memories of the victims of the Chowchilla, California school bus kidnapping. The children had been kidnapped from their school bus and then buried underground for sixteen hours. When Terr interviewed the children both immediately and four to five years later, she found that about half of the children made dramatic errors in recall.⁸⁹ Some of the children had remembered accurately immediately after the kidnapping, but remembered incorrectly in the later interviews, even to the extent of adding two additional kidnappers.⁹⁰ Clearly, even initially accurate traumatic memories are susceptible to change and distortion over time.

Similarly, a study of children’s memories for a sniper attack at an elementary school in 1984 revealed distortions in memory for events during the attack. More surprisingly, however, some children who were not at school during the attack later remembered that they were.⁹¹

Ornstein et al., *Children’s Memory for a Personally Experienced Event: Implications for Testimony*, 6 APPL. COGN. PSYCHOL. 49 (1992).

⁸⁸ Lenore C. Terr, *Psychic Trauma in Children: Observations Following the Chowchilla School-Bus Kidnapping*, 138 AM. J. PSYCHIATRY 14 (1981).

⁸⁹ *Id.* at 14-17.

⁹⁰ *Id.* at 18.

⁹¹ Robert S. Pynoos & Kathi Nader, *Children’s Memory and Proximity to Violence*, 28 J. AM. ACAD. CHILD ADOLESC. PSYCHIATRY 236 (1989).

Willem Wagenaar and J. Groeneweg⁹² illustrated the “*tunnel memory*” phenomenon of superior memory for central detail of traumatic or emotional events in survivors of Nazi death camps. Comparing the memories of survivors of Camp Erika a few years after their release with those forty years later, the authors found remarkable consistency regarding camp conditions and daily routines but poor recall of the names of fellow prisoners and guards.

Among the traumatic memories widely considered to be virtually exact replays of the original trauma are the “*flashbacks*” experienced by victims of posttraumatic stress disorder (PTSD) such as war veterans, rape victims, or victims of other violent crime or disasters. However, research has shown that even such flashbacks are sometimes more likely to represent a combination of real and feared or imagined events.⁹³ In some respects, such flashbacks represent the “*worst fears*” of the victim, rather than precise memories.

Finally, research fueled by the currently raging controversy over “*recovered*” memories of sexual abuse has documented through both case studies and laboratory demonstrations that memory for sexual abuse and other traumatic experiences can be distorted and even fabricated completely through biasing therapeutic and memory retrieval techniques.⁹⁴

D. Are Memories for Traumatic Events More or Less Accurate Than Those for Mundane Events?

Although no doubt exists that memory for traumatic events can be inaccurate, controversy exists regarding whether memory for traumatic events is superior to that for mundane events. As noted earlier, laboratory studies have tended to indicate that memory for central detail is superior under stress, whereas memory for peripheral detail suffers.

Similar issues have been addressed in field studies of victims or witnesses to traumatic events. Generally, these studies have shown that memories for traumatic events can be quite accurate and fade little with time. Studies of both victims and bystander

⁹² Willem A. Wagenaar & J. Groeneweg, *The Memory of Concentration Camp Survivors*, 4 APPL. COGN. PSYCHOL. 77 (1988).

⁹³ J.T. MACCURDY, WAR NEUROSES (1918); SCHACTER, *supra* note 2, at 266.

⁹⁴ Elizabeth F. Loftus, *The Reality of Repressed Memories*, 48 AM. PSYCHOL. 518, 526-33 (1993); ELIZABETH F. LOFTUS & KATHERINE KETCHAM, THE MYTH OF REPRESSED MEMORY (1994); RICHARD OFSHE & ETHAN WATTERS, MAKING MONSTERS: FALSE MEMORIES, PSYCHOTHERAPY, AND SEXUAL HYSTERIA (1994).

witnesses to non-sexual events, for example, have compared witness reports immediately after the crime with recall months later. Although some errors occur after the delay, reports are generally stable across time.⁹⁵ Sven Christianson and B. Hubinette⁹⁶ found, however, that victims' reports were more accurate than those of bystanders.

Exactly the opposite was found in studies of the memories of adult victims of rape.⁹⁷ They found the familiar tendency toward better memory for central than peripheral details, along with reasonable accuracy and good retention over time. However, when memories for rape were compared to memories for other intensely unpleasant experiences, the authors found that memories for rape were less accurate, less clear and vivid, less meaningfully organized, less thought and talked about, but more emotionally intense. Similarly, L.L. Keuhn⁹⁸ found that victim's ability to describe race, sex, age, height, weight, build, complexion, hair color, and eye color of their assailants was inversely related to the severity of the crime. Rape victims and injured victims were less accurate and complete than robbery and uninjured victims.

Thus, at this point, no clear answer exists regarding whether traumatic memories will be superior or inferior to memories for more mundane events. On the other hand, it is abundantly clear that they can be either very clear and accurate or very inaccurate.

To evaluate the likelihood of memory distortion for any given witness or victim, the memory expert would need to consider the entire context in which the event took place and the nature of the event itself in combination with the personality and background of the witness.

⁹⁵ John C. Yuille & Judith Cutshall, *A Case Study of Eyewitnesses of a Crime*, 71 J. APPL. PSYCHOL. 291, 294 (1986); Sven-Ake Christianson & B. Hubinette, *Hands Up: A Study of Witnesses' Emotional Reactions and Memories Associated with Bank Robberies*, 7 APPL. COGN. PSYCHOL. 365 (1993).

⁹⁶ Christianson & Hubinette, *supra* note 95, at 365.

⁹⁷ Mary P. Koss et al., *Traumatic Memories: Empirical Foundation, Forensic, and Clinical Implications*, 2 CLIN. PSYCHOL. SCI. PRAC. 111 (1995); Shannon Tromp et al., *Are Rape Memories Different? A Comparison of Rape, Other Unpleasant, and Pleasant Memories Among Employed Women*, 8 J. TRAUMA. STRESS 607 (1995).

⁹⁸ L.L. Keuhn, *Looking Down a Gun Barrel: Perception and Violent Crime*, 39 PERCEPT. MOT. SKILLS 1159 (1974).

E. Brain Mechanisms Underlying Traumatic Memories

Evidence is accumulating that brain mechanisms underlying encoding and persistence of traumatic memories may be unique. Modern cognitive neuroscience has used technologies such as PET scans to examine brain activity during encoding of emotional versus non-emotional material. These studies, in combination with studies of animals or patients with brain damage, have indicated that the amygdala is crucial to encoding of emotional but not unemotional material. The amygdala shows increased activity during exposure to emotional material. The degree of such activity is related to later memory for emotional material but not to memory for unemotional material; and damage to the amygdala is associated with failure to retain emotional material but not unemotional material. These and other findings indicate a unique role of the amygdala in encoding emotional material.⁹⁹

3. Injury

Although clear evidence of amnesia through psychological trauma may be lacking,¹⁰⁰ there can be no doubt that physical trauma can create memory loss ranging from complete loss of identity to temporary amnesia. The most common forms of memory loss resulting from trauma to the head are “*retrograde amnesia*,” or failure to remember events preceding the physical or psychological trauma, and “*anterograde amnesia*,” or difficulty remembering everyday events and activities following trauma. The latter is more likely to become an issue in litigation as a claim for damages.

“*Retrograde*” amnesia, however, is commonly an issue either as a claim for damages or as a problem of witness testimony. It is important to note that amnesia for a traumatic event that results from head injury is often permanent. Thus, when confronted with a witness who has apparently “*recovered*” memory for the event, the attorney should carefully examine the potential for post-event influences to have created confabulated memories.

Clear evidence exists to show that “*retrograde amnesia*” due to physical trauma is not reversible, as it results from failure to enter information into long-term memory. The ability to com-

⁹⁹ Larry Cahill & James L. McGaugh, *Mechanisms of Emotional Arousal and Lasting Declarative Memory*, 21 TRENDS NEUROSCI. 294 (1998); Schacter, *supra* note 2, at 192.

¹⁰⁰ SCHACTER, *supra* note 2, at 212.

plete the consolidation of short-term into long-term memory is interrupted by serious head injuries. Those sustaining such injuries are virtually inevitably unable to remember the accident itself or the few minutes preceding it, and virtually never recover those memories.¹⁰¹

Philip Yarnell and Steve Lynch cleverly demonstrated this.¹⁰² The authors studied the memories of football players for the play leading up to a "*ding*" (a particularly hard hit dazing the player). Each time a ding occurred, the researchers rushed to his side within roughly the first thirty seconds and interviewed him about the play and again interviewed him twenty minutes later after he had recovered. All dinged players were able to remember what happened and what play they had run at the initial interview, but by the second interview, they remembered neither what happened to them nor what play was run.

C. FAILURES OF INTERPRETATION

*"Memories are replicas of how we have experienced the events, not replicas of the events themselves."*¹⁰³

Contrary to popular belief, memory does not work like a video camera, recording exactly what it physically perceives. The act of encoding does not simply create a visual or auditory memory trace of exactly what happened, a judgment-free snapshot stored unchanged and available for retrieval and review. Instead, the act of encoding includes *interpretation*. We encode a combination of visual and semantic (meaning) aspects of the event, something that holds the meaning, sense, and emotions the experience provided us. Often, these meanings will remain clearer over time than the sensory memory, such that they become the primary basis of later reports of the event.

1. *Consequences of Failures of Interpretation*

This role of interpretation would not be problematic if our interpretations were uniformly accurate and unbiased. However, this is clearly not the case. Instead, it is clear that memory may be compromised by failures of semantic encoding, including either forgetting or distortion.

¹⁰¹ SCHACTER, *supra* note 2, at 134.

¹⁰² Philip R. Yarnell & Steve Lynch, *The "Ding": Amnesic States in Football Trauma*, 23 NEUROLOGY 196 (1973).

¹⁰³ SCHACTER, *supra* note 2, at 6.

a. Forgetting Due to Inability to Understand

Forgetting will tend to occur when the witness cannot understand what was observed sufficiently to engage semantic processing (i.e., could not categorize or identify what was observed). Since encoding into long-term memory tends to involve the *meaning* of an event more strongly than simple physical features, if meaning cannot be assigned, material will less likely enter long-term memory. If, nevertheless, the material is stored in long-term memory, it is more likely to be inaccurate.

b. Distortion Due to Incorrect Understanding

*"The image at the eye has countless possible interpretations."*¹⁰⁴

Distortion occurs when the observer does assign meaning to what is observed, but for some reason chooses the *incorrect* interpretation or label. As we will elaborate below, distortion tends to occur as a result of either: (a) predictable distortion in sensory perception (b) contextual cues that suggest a particular interpretation (including social influence) or (c) characteristics of the observer that might bias interpretation of what (s)he observes, such as existing attitudes, motivations, stereotypes, expectations, thoughts, or understandings. A particularly unfortunate example of this problem is the recent police shootings of unarmed blacks who police mistakenly believe to possess a weapon. Stereotypes associating blacks with violence lead police to "*see*" a weapon rather than the actual object or empty hand.¹⁰⁵ Keith Payne compellingly demonstrated the power of expectations associating blacks with violence in a recent study.¹⁰⁶ Payne demonstrated that merely seeing a black face led subjects to be more likely to mistake objects for weapons, even when the objects were presented independently of the face. Thus, the associations to weapons and violence elicited by the black face were so strong as to affect perceptions of objects not associated physically with the black face.

¹⁰⁴ D.D. HOFFMAN, VISUAL INTELLIGENCE 13 (1998).

¹⁰⁵ Nancy Firor & Joshua Kurlantzick, *Under Siege in Cincinnati*, U.S. NEWS & WORLD REPORT April 23, 2001, at 30.

¹⁰⁶ B. Keith Payne, *The role of automatic and controlled processes in misperceiving a weapon*, 81 J. PERS. & SOC. PSYCHOL. 181-192 (2001).

2. *Failure of Interpretation Through Difficulty/Ambiguity of Perception*

A witness may be asked about any number of different facts and events, some of which may be very difficult to accurately perceive. In such cases, errors in witness reports may be common, occurring more likely than not. They will result from direct failures of perception due to difficulty, from greater susceptibility to distortion in interpretation through contextual cues or social influence from other observers, or through the influences of the observer's own personal motivations and biases.

Years of research on persuasion and social influence, for example, have demonstrated that perceptions and opinions are most malleable through influence when the person is less certain of his(her) existing views. Solomon Asch,¹⁰⁷ for example, demonstrated this process using a perception task where he varied the difficulty of the perceptual judgment. He found that subjects' reported judgments were more affected by those of other participants as the ambiguity of the stimulus increased. Generally, conformity is greater when a person feels incompetent or uninformed, when the task is difficult, or when (s)he really cares about being right.¹⁰⁸ Thus, under certain circumstances, the potential for influence from others to affect the *meaning* a witness encodes into semantic memory is great.

Similarly, perception research has illustrated the importance of motivation on perceptions of ambiguous stimuli. A hungry person, for example, is more likely to interpret an ambiguous stimulus to be food. On the other hand, research on perceptual defense has shown that people show resistance to accurate perceptions of ambiguous objects related to anxiety-provoking motivations. This resistance may be manifested in longer times to recognize the objects, or tendencies to mislabel them in less anxiety-provoking terms.

While social influence and motivational processes operate broadly and can affect interpretation of less ambiguous objects and events, ambiguity increases the opportunity for distortion through either mechanism.

¹⁰⁷ Solomon E. Asch, *Opinions and Social Pressure*, SCI. AM. 31 (Mar. 1955).

¹⁰⁸ Alice H. Eagly, *Sex Differences in Influenceability*, 85 PSYCHOL. BULL. 86 (1978); Alice H. Eagly et al., *Causal Inferences About Communicators and Their Effect on Opinion Change*, 36 J. PERS. & SOC. PSYCHOL. 424 (1978).

a. The Importance of Knowledge, Expertise and Familiarity

As a general rule, familiarity, knowledge or expertise regarding either the general *type* of objects and events being observed or with the *specific* objects, persons and events in question increases the ease, efficiency and accuracy of encoding. Think of chess masters, for example, who can remember the entire configuration of a chessboard with one glance, and even play full matches with one another in their heads. Novices, in contrast, may have difficulty even labeling the pieces and find it impossible to remember their location. Similarly, while a pilot might glance briefly at the plane's instrument panel and accurately encode and remember the status of the gauges, a novice passenger would be unlikely to either understand or later remember them.

Generally then, witness reports regarding unfamiliar objects and events are more susceptible to error. The unfamiliar is inherently more ambiguous to the observer, and therefore more difficult to understand. This renders the observer more susceptible to both direct errors of interpretation and indirect errors due to internal and external influences on interpretation, such as personal motivations or influence from other observers or contextual cues.

Sometimes expertise or familiarity is tied to gender. One study of eyewitness performance examined male and female ability to accurately recall features of an event considered more male or female oriented (i.e., of greater interest and familiarity to males versus females). As expected, each sex was more accurate and less easily influenced by misleading questions on the issues "*oriented*" toward their gender.¹⁰⁹ Thus, to the extent that gender-related features of an event are the subject of witness testimony, it is important to note that each gender (or indeed, each individual) will tend to be more accurate in areas of particular interest or expertise. In aviation cases, for example, males may tend to be more accurate observers and recorders of the technological flight-mechanics-oriented features of the event than females.

Expertise may also be tied to age. Clearly young children do not have well-developed or elaborate knowledge structures in many areas—including those regarding objects or actions in aircraft, or situations leading to disaster. Not being able to understand what they see, they will later be unable to remember.

¹⁰⁹ P.A. Powers et al., *Eyewitness Accounts of Males and Females*, 64 J. APPL. PSYCHOL. 339 (1979).

b. Some Specific Areas of Difficulty in Perception

*"Shall we henceforth distrust the witness of vision,
knowing now its penchant to perjure?"*¹¹⁰

While psychological research on fundamental perceptual processes has identified some difficult areas of perception, other difficult areas have been identified in the eyewitness literature.

1. *Duration*

Generally, people tend to overestimate the duration of complex events. Studies of witness time estimations have shown that witnesses consistently tend to overestimate the duration of events by a factor sometimes as high as thirty-to-one or more. On the average, overestimations tend to be more in the range of two or three to one. However, while underestimations are rare, overestimations are common and sometimes extreme. Elizabeth Loftus and her colleagues, Schooler, Boone, and Kline,¹¹¹ for example, found that some subjects remembered a thirty-second bank robbery tape as having lasted over fifteen minutes.

Further, arousal and stress tend to lead to even greater overestimation.¹¹² The high stress and complexity characteristic of aviation accidents would be expected to compromise time estimations among passengers and ground crews alike.

2. *Speed, Distance and Direction*

a. *Speed*

Estimates of both speed and distance are notorious for their susceptibility to error.¹¹³ Both are important in cases involving vehicular accidents of all kinds, and are subject to both over- and underestimation.

Estimates of speed, for example, depend upon the size of the moving object, such that large objects appear to move more slowly than small objects. Herschel Leibowitz and D. Alfred

¹¹⁰ HOFFMAN, *supra* note 104, at 3.

¹¹¹ Elizabeth F. Loftus et al., *Time Went by So Slowly: Overestimation of Event Duration by Males and Females*, 1 APPL. COGN. PSYCHOL. 1 (1987).

¹¹² Christianson & Loftus, *supra* note 67, at 225; Loftus et al., *supra* note 111, at 1; A.L. SCHNEIDER ET AL., PORTLAND FORWARD RECORDS CHECK OF CRIME VICTIMS (1987).

¹¹³ LOFTUS & DOYLE, *supra* note 11; Keith K. Niall, *The Art of Descrying Distance*, 41 HUM. FACTORS 511 (1999).

Owens¹¹⁴ reported this phenomenon with respect to airplanes and trains. For example, they noted that although all jets land at roughly the same speed, jumbo jets appear to land more slowly than smaller jets. Similarly, large locomotives appear to move more slowly than their actual speed, a factor Leibowitz and Owens believed to contribute to the many accidents each year in which a car tries to cross the tracks in front of a too rapidly approaching train. In contrast, Elizabeth Loftus and James Doyle¹¹⁵ illustrated the reverse problem, citing a case where the speed of a relatively small vehicle (a motorcycle) was seriously overestimated.

Generally then, although estimates of speed are common in trials involving vehicular accidents of various kinds, they tend to be unreliable. They vary substantially between witnesses to the same event¹¹⁶ and may tend to over- or underestimate actual speed depending upon the size of the object in question.¹¹⁷

b. Distance

Estimates of distance are similarly difficult. Distortion of distance in spatial memory becomes greater with longer distances.¹¹⁸ People may produce systematic over or underestimations, or may show asymmetries. For example, they may estimate the distance from their house to a mailbox as different from the distance from the mailbox to the house.¹¹⁹

Distance estimates can be affected by the nature of the intervening space. For example, Kazunori Hanyu and Yukio Itsukushima¹²⁰ showed that estimated distances and times for walking were greater for stairways than for equally long flat paths. Similarly, other studies have examined the relationship

¹¹⁴ Herschel W. Leibowitz & D. Alfred Owens, *We Drive by Night*, 20 PSYCHOL. TODAY 54 (1986).

¹¹⁵ LOFTUS & DOYLE, *supra* note 11, at 22.

¹¹⁶ J. MARSHALL, LAW AND PSYCHOLOGY IN CONFLICT (1966).

¹¹⁷ Leibowitz & Owens, *supra* note 114, at 20; but see Robert J. Herstein & Margaret L. Walker, *Perception of Vehicle Speed as a Function of Vehicle Size*, 31 BULL. PSYCHO. SOC. 566 (1993).

¹¹⁸ Linda J. Anooshian & Megan K. Kromer, *Children's Spatial Knowledge of Their School Campus*, 22 DEV. PSYCHOL. 854 (1986).

¹¹⁹ Nora Newcombe et al., *What Do Misestimations and Asymmetries in Spatial Judgment Indicate About Spatial Representation*, 25 J. EXP. PSYCHOL. LEARN. MEM. COGN. 986 (1999); Niall, *supra* note 113, at 511.

¹²⁰ Kazunori Hanyu & Yukio Itsukushima, *Cognitive Distance of Stairways: Distance, Traversal Time, and Mental Walking Time Estimations*, 27 ENVTL. BEHAV. 579 (1995).

between travel time, effort, and distance estimates.¹²¹ Some studies of distance estimations have been conducted with blindfolded walkers,¹²² having potential application in cases of abducted witnesses.

Distance tends to be overestimated when a barrier is placed between objects, or when spatial "clutter" exists such as many turns or landmarks.¹²³ Estimates also differ between "egocentric" (distance between oneself and other objects) and "exocentric" (distance between two other objects), such that egocentric estimates tend to be underestimated.¹²⁴ Distance estimates are also affected by characteristics of the observer. Adults, for example, are more accurate than children.¹²⁵

Estimates of distance and size reciprocally affect one another,¹²⁶ and size estimates become more difficult with increasing distance.¹²⁷

Distance estimates for moving objects are affected by perceived speed and vice versa.¹²⁸ Some investigators have examined the foibles of distance and speed estimates among drivers in an attempt to understand causes of accidents. For example, Ota Hiro¹²⁹ showed that when drivers drove at higher

¹²¹ James F. Herman & Christine A. Klein, *The Effect of Travel Effort on Children's Distance Estimations*, 4 BR. J. DEV. PSYCHOL. 353 (1985); James F. Herman et al., *Children and Adults' Distance Estimations in a Large-Scale Environment: Effects of Time and Clutter*, 36 J. EXP. CHILD PSYCHOL. 453 (1983); James F. Herman et al., *Time and Distance in Spatial Cognition Development*, 7 INT'L J. BEHAV. DEV. 35 (1984).

¹²² Erik Lindberg & Tommy Gaerling, *Acquisition of Locational Information About Reference Points During Blindfolded and Sighted Locomotion: Effects of a Concurrent Task and Locomotion Paths*, 144 UMEA PSYCHOL. REP. 19 (1978).

¹²³ Mary Gauvain, *Sociocultural and Practical Influences on Spatial Memory*, in MEMORY DISTORTIONS AND THEIR PREVENTION 89 (Margaret J. Itons-Peterson & Deborah L. Best eds., 1998).

¹²⁴ Jack D. Reising & Elizabeth L. Martin, *Distance Estimation Training with Night Vision Goggles Under Low Illumination*, in JSAF AMRL TECHNICAL REPORT AL/HR-TR-1994-0138 I1994-0138 iii-22 (Jan. 1995).

¹²⁵ John T. Corlett et al., *Locomotor Estimation of Distance After Visual Scanning by Children and Adults*, 14 PERCEPT. 257 (1985).

¹²⁶ Mark F. Bradshaw et al., *The Interaction of Binocular Disparity and Motion Parallax in Determining Perceived Depth and Perceived Size*, 27 PERCEPT. 1317 (1998); Eli Brenner & Wim J M van Damme, *Perceived Distance, Shape and Size*, 39 VIS. RES. 975 (1999); Tadasu Oyama, *Perceived Size and Perceived Distance in Stereoscopic Vision and an Analysis of Their Causal Relations*, 16 PERCEPT. PSYCHOPHYS. 175 (1974).

¹²⁷ William Epstein & Krishan D. Broota, *Attitude of Judgment and Reaction Time in Estimation of Size at a Distance*, 18 PERCEPT. PSYCHOPHYS. 201 (1975).

¹²⁸ Robert Gray & David Regan, *Do Monocular Time-to-Collision Estimates Necessarily Involve Perceived Distance*, 28 PERCEPT. 1257 (1999).

¹²⁹ Ota Hiro, *Distance Perception and Driving*, 55 TOHOKU PSYCHOLOGICA FOLIA 92 (1996).

speeds, they underestimated the distance between their own cars and others, compared with estimations made at lower speeds. Donald Gordon and his colleagues¹³⁰ showed that drivers could not correctly estimate overtaking and passing distances. Average errors of estimation for various conditions varied between 20% and 50% of actual overtaking distance. Further, errors of underestimation increased with speed. At 18 mph, 15% of estimates were low, whereas at 50 mph, 68% were low.

Some studies have specifically examined the accuracy of speed and distance estimations for aircraft in flight, including the effectiveness of training in aircraft recognition and velocity judgments. They include accuracy for both unaided and technologically assisted estimates, ability to visually estimate the distance to high-speed jets, and ability to track aircraft by ear. These studies also attempted to determine the distances at which various aircraft structural features could be recognized.¹³¹

One study specifically examined memory for distance.¹³² Performance was best for estimates made while the objects were visible. Accuracy declined for estimates made from memory (even when made immediately after seeing the stimulus objects), particularly when subjects had to integrate several pieces of spatial information to estimate distance.

Finally, some studies have examined estimates of distance from sound.¹³³ The results have suggested that distance hearing is accurate mainly in detecting variations in the distance of the source, but is relatively inaccurate for estimation of absolute distance.

c. Direction

Distortions in directional perception and memory are common when complex inferences are required; for example, taking many turns and/or reversing directions, even along a

¹³⁰ Donald A. Gordon, & Truman M. Mast, *Drivers' Judgments in Overtaking and Passing* 12 HUMAN FACTORS 341 (1970).

¹³¹ R.D. Baldwin, *Capabilities of Ground Observers to Locate, Recognize, and Estimate Distance of Low-Flying Aircraft*, in MUNRRO TECHNICAL REPORT 56 (1973); E.W. Frederickson et al., *Aircraft Detection, Range Estimation, and Auditory Tracking Tests in a Desert Environment*, in HUMRRO TECHNICAL REPORT 38 (1967).

¹³² Gabriel A. Radvansky et al., *Uncertainty in Estimating Distances from Memory*, 23 MEM. & COGN. 596 (1995).

¹³³ E.V. Kozhevnikova, *Auditory Estimate of the Distance of a Sound Source*, 4 SENS. Sys. 156 (1990).

familiar route. Such distortions are more common among children than adults, and are smaller for familiar routes or spaces. Further, the ability to use available markers or landmarks in a particular space increases with experience in that space or similar spaces.¹³⁴

One reason for distortions under complex conditions is the tendency for people to *normalize angles* toward ninety degrees. When drawing roads from memory, for example, all kinds of angles are distorted toward ninety degrees. Generally, spatial distortions reflect tendencies toward simplification, regularization (distortion toward familiar angles and shapes), and organization.¹³⁵

3. Sequence

Memory for the sequence of events is often poor. This problem is found in memory for single events, in which the sequence of specific actions within the event may be an issue (who hit who first, for example). However, the problem can become particularly acute for sequences of events ranging over longer time spans, such as those typically involved in complex civil litigation. Studies of autobiographical memory have shown that memory for *when* something happened is far less accurate than memory for *what* happened.¹³⁶

4. Color

Color is often a crucial feature of evidence. Witnesses in criminal trials are routinely asked to describe the appearance of the perpetrator or other participants, including the color of hair, skin, or clothing (and perhaps that of objects or weapons involved in the action). Witnesses to a hit and-run accident may be asked to describe the color of the car. Often, the object in question is more unusual, such as the color of a pill, a gauge, or a piece of paper. Whatever the object in question, proper color identification may well affect the outcome of the case.

¹³⁴ Gauvain, *supra* note 123, at 89.

¹³⁵ See *id.*

¹³⁶ Steen F. Larsen et al., *Time in Autobiographical Memory*, in REMEMBERING OUR PAST: STUDIES IN AUTOBIOGRAPHICAL MEMORY 129 (D.C. Rubin ed., 1996); Willem A. Wagenaar, *My Memory: A Study of Autobiographical Memory Over Six Years*, 18 COGN. PSYCHOL. 225 (1986); Willem A. Wagenaar, *Autobiographical Memory in Court*, in REMEMBERING OUR PAST: STUDIES IN AUTOBIOGRAPHICAL MEMORY 180 (D.C. Rubin ed., 1996).

Perception of color may seem simple, something most of us take for granted. In fact, color vision is far from a simple process. Rather, it is a complicated system that may be compromised by either organic dysfunctions of the vision system or contextual circumstances interfering with its ability to operate properly. If color is an important issue in a witness' testimony, it would be important to know if (s)he suffers from any organic problem that would compromise color vision, or whether other internal or external factors may have compromised color vision—such as colored sunglasses.

a. Organic Problems With Color Vision

A person may be “*color blind*” in varying type and degree. Some who have no functioning cones (the structures responsible for color vision) are “*monochromatic*,” or totally color blind, and see the world in shades of white, gray, and black. Monochromats are rare (about one in a million) and tend to have poor visual acuity, and difficulty seeing at all in bright lights.¹³⁷

“*Dichromats*” lack one of three pigments typically found in the cones. Some are red-green blind and see the world in shades of blue and yellow. Others, although fewer, are blue-yellow blind and thus, see shades of red and green. Each dichromatic disorder is more common among males than females, as it is caused by a recessive sex-linked gene that women may carry but rarely express.¹³⁸

Color blindness will cause an obvious problem with correct identification of color. However, it can also cause difficulties with one's ability to distinguish one object from another. Just as camouflage can prevent a person with normal vision from seeing an object against a background of similar color, the restriction in range of color among color blind individuals can, in effect, function as camouflage for many objects. For monochromats, many colors will appear to be the same or similar shades of gray. Thus, each can provide camouflage for the others. Similarly, for those who cannot distinguish blue from green, a blue object may not be visible against a green background.

Most color blindness is genetic and therefore present from birth. However, problems of color perception may also be caused by diseases such as alcoholism, glaucoma, diabetes, or

¹³⁷ YVES LEGRAND, *LIGHT, COLOR AND VISION* (1957).

¹³⁸ Jeremy Nathans et al., *Molecular Genetics of Human Color Vision: The Genes Encoding Blue, Green, and Red Pigments*, 232 SCI. 193 (1986).

age-related macular degeneration, or by trauma to the visual cortex.¹³⁹ Age-related macular degeneration and diabetes are both associated with destruction of cones. After age fifty or so, blues can begin to look darker and become more readily confused with greens. Thus, an older person may confuse one pill for another, one car for another, one color panel or dial with another, or fail (because of fading color contrast) to distinguish two objects from one another at all.¹⁴⁰

An opposite condition occurs for those suffering from “*night blindness*”—difficulty in dark adaptation. Such persons have rods that fail to operate sufficiently in poor light. Thus, they experience poor visual acuity under poor illumination, seeing objects as fuzzy and indistinct, and may also have difficulty recognizing familiar faces under dim street lamps or driving at night.

b. Context and Color Perception

Under most circumstances, we enjoy good color “*constancy*”—the ability to see the same color even when viewing context changes. Nevertheless, there are certain viewing conditions that substantially alter color perception.

i. Illumination

The most important contextual influence on color vision is illumination. As illumination decreases, two important changes take place.

A. Shift From Cone to Rod Vision

First, color vision dims and then fades completely. We shift to rod vision, and the cones necessary for color vision cease to function. Thus, at night under moonlight everything appears as shades of gray. Lacking color contrast, objects appear less clear, and our ability to distinguish between them is compromised. The features (including color) of people, clothes, objects, and actions become more difficult to clearly perceive and identify. Blood, for example, may be misidentified in moonlight because

¹³⁹ A.J. Adams, *Chromaticity and Luminosity Changes in Glaucoma and Diabetes*, in COLOR DEFICIENCIES, VI: PROCEEDINGS OF THE SIXTH SYMPOSIUM OF THE INTERNATIONAL RESEARCH GROUP ON COLOR VISION DEFICIENCIES 413 (Guy Verriest ed., 1982); E. BRUCE GOLDSTEIN, SENSATION AND PERCEPTION (1999).

¹⁴⁰ P.D. Hurd & J. Blevins, *Aging and the Color of Pills*, 310 N. ENGL. J. MED. 202 (1984); ROBERT ALEXANDER WEALE, A BIOGRAPHY OF THE EYE: DEVELOPMENT, GROWTH, AGE (1982).

it will appear to be black in the absence of sufficient illumination.

B. "Purkinje Shift"

Second, objects that appear relatively brighter in daylight will appear relatively darker under moonlight, a phenomenon called the "*Purkinje shift*."¹⁴¹ Thus, while objects at the red (long wavelengths) end of the color spectrum will appear brighter in daylight, those at the blue (short wavelengths) end will appear brighter in moonlight (for example, a red tomato will appear brighter than the green vine in daylight, but the vine will appear brighter at night). Failure to understand this shift in apparent brightness may lead police or other investigators to search for clothing or other objects of the wrong color. A blue shirt (which appears brighter at night than an orange one) could lead to a search for a lighter colored shirt, notwithstanding the fact that the actual blue shirt in question appears relatively dark in normal daylight.

C. Band and Band Width

Even when there is apparently sufficient illumination, color vision may be compromised by the nature of the lights in question. Narrow band lights (red or blue, for example) or sodium lamps found in many parking lots will narrow the range of visible color toward those in the narrow spectrum of the light.

Thus, witness reports of color *must* be understood in the context of the lighting conditions under which the event was witnessed, including both the degree of illumination and the width of the light's color band.

ii. *Changes in Illumination: Light and Dark Adaptation*

Further, one must consider sudden *changes* in illumination. *Light adaptation*, which occurs in response to changes from darker to lighter conditions, takes place relatively quickly, within a matter of a few seconds. *Dark adaptation*, on the other hand, occurs more slowly. When plunged from bright illumination into darkness, humans have difficulty seeing at first. Full recov-

¹⁴¹ Joseph Brozek, *Contributions to the History of Psychology: LII. Perkinje Phenomenon: The Original and a Later Account*, 68 PERCEPT. MOT. SKILLS 566 (1989); Josef Brozek & Vilem Kuthan, *Contributions to the History of Psychology: LXXI. "Purkinje Phenomenon": The Genesis and the Early Uses of the Term in French, German, and English*, 71 PERCEPT. MOT. SKILLS 1253 (1990).

ery of the cones can take about five minutes, whereas full recovery of the rods can take about thirty minutes, depending upon the length and brightness of the previous illumination. During that time, one will first have difficulty distinguishing objects at all and subsequently have difficulty seeing clearly and distinguishing brightness between objects. When dark adaptation is complete, most people can see reasonably well under dim illumination, excluding color.

While the focus of this paper is on witness memory, it is worth mentioning that issues of color vision may be important with regard to product liability aspects of aviation litigation. That is, to the extent that instrument panels and other displays that affect the operation of an aircraft or the ability of crew and passengers to respond to emergency situations use color in ways that impair ability to rapidly identify and interpret necessary objects, portals or signals, the product may be deemed defective. Color vision experts are hired to aid in the design of aircraft for just these reasons, and may be similarly engaged as expert witnesses on product design.

3. *Failures of Interpretation Through "Schematic" Processing*

Theories of information processing converge on the assumption that all information processing is "*schematic*" in nature. That is, it is driven by expectations and assumptions based on previous experience and existing knowledge. The following sections will summarize the basic effects of schematic processing on interpretation of information or events. For a detailed review of literature documenting the processes we will describe, see texts on "*Social Cognition*."¹⁴²

a. The Nature of Schemas

"*Schemas*" are defined as cognitive structures representing knowledge about a concept or type of stimulus, including its attributes and the relationships among those attributes. A schema includes a dictionary definition of the concept, object, or event, along with a host of expectations concerning what it is like, how it behaves, what it should look like, and much more. As noted earlier, we possess a variety of schema types including: (a) *category schemas* telling us what the members of particular social or object categories are like; (b) *person schemas* telling us what to

¹⁴² KUNDA, *supra* note 53, at 23; FISKE & TAYLOR, *supra* note 51, at 10.

expect of particular individuals (c) *self-schemas* consisting of how we think about ourselves (d) *role schemas* telling us what individuals occupying particular social roles should be like and how they should behave; (e) *event schemas* (or *scripts*) containing expectations for particular events or event categories; and (f) *causal schemas*, telling us what tends to cause what, and how it does so.

These schemas are crucial for information processing. They allow us to instantly identify people, objects, and events and to understand what we see. Without schemas, we would not know what to expect from individuals or categories of individuals or how to treat them. We would not know how to behave in various social situations or how to evaluate the behavior of others. Generally, schemas allow us to understand and evaluate what we see and plan what to do—in other words, they allow us to function in the world.

Like memory, we cannot function without schemas and schematic processing. However, also like memory, schemas have a dark side, leading to predictable errors in memory and judgment.

b. How Schemas Affect Interpretation

1. *Inference: Filling in with "Default Assumptions"*

By definition, schemas include expectations concerning the nature of people, objects and situations, and how they will behave. When we perceive, we cannot encode the entire set of information we see. Instead, we encode the "*gist*" of what we encounter. Both at the time, and later as we remember the information, we tend to "*fill in*" what we have seen with the "*default values*" suggested by our schemas and expectations. A number of experiments have demonstrated this tendency to remember both more and less than what we actually see. We do not remember schema-irrelevant information as well as schema-relevant information, and we add information that makes sense based on what we did see and what our expectations, knowledge, and schemas would lead us to *expect* that we should have seen.

2. *Biased Interpretation*

"Ideas of the cavern are the ideas of every man in particular; We every one of us have our peculiar den, which refracts and corrupts the light

of nature, because of the differences of impressions as they happen in a mind prejudiced or prepossessed."¹⁴³

Just as schemas tell us what to *expect* in certain situations and from certain people, they also tell us how to *interpret* what we see. Imagine, for example, attending a circus with no schema for what a circus is, who the performers are, or what they are doing. Everything would seem confusing.

We need the interpretive function of schemas to understand and function in the world. However, just like all of our other information processing systems, the same things that make the interpretative function of schemas so important also give it the potential to lead us astray.

The effects of schemas on how we interpret what we see have been documented in countless domains. For example, we are more likely to interpret a person's behavior as involving *psychopathology* if we know (s)he is a mental patient, more likely to interpret a black than a white person's behavior as *criminal*, a person's comments as hostile if we think of them as a hostile person, and so on. Our schemas can lead us to see what we expect to see rather than what is truly there.

c. What Determines Which Schemas Influence Perception?

A number of factors determine what schemas will be activated and affect perception in a given person or situation, ranging from current moods, what we happened to recently encounter or think about, salient goals, what schemas we characteristically use or think about, and so on. We will not review all determinants of schema use. However, the following are some of those most pertinent to witness perceptions.

1. *Situational Context*

Often, the situation we are in will activate a particular schema. When we enter a restaurant, for example, our "*restaurant script*" becomes activated, and we expect things to happen in general conformity with this script.

2. *Social Context and Influence*

Interpretation may be biased through the influence of others. For example, imagine that you saw a man take the upper arm of

¹⁴³ FRANCIS BACON, NOVUM ORGANUM SCIENTARUM, Section II, Aphorism V (1620).

a woman in his hand as he talked to her. The physical act you observed may be interpreted in a number of ways—varying from hostility and aggression to love and affection. Now, imagine instead that someone else had said, “*Look, he’s hurting her!*” before you turned to observe the man holding the woman’s arm. Your perception and interpretation of the event would be biased by the label applied by the other person, causing you to activate a schema for “*aggressive*,” “*fighting*,” “*danger*,” etc. You would be more likely to *perceive* the act as aggressive and more likely to *remember* it as aggressive later.

3. *Individual Witness Differences*

“*We don’t see things as they are, we see them as we are.*”¹⁴⁴

a. *Personal History*

*“As the central point of the perceptual field, the phenomenal self is the point of orientation for the individual’s every behavior. It is the frame of reference in terms of which all other perceptions gain their meaning.”*¹⁴⁵

We do not encounter the events of our lives as a blank slate. Current motivations and emotions, in combination with our vast accumulated store of knowledge, opinions and past experiences, provide the template against which new experience is instantly evaluated, understood and categorized.

The O.J. Simpson trial provided a perfect illustration of the way in which accumulated life experiences shape interpretation. Recall the difference in how blacks and whites interpreted the potential for police planting or contaminating evidence. It was, well, “*black and white*.” Whites believed the DNA evidence and discounted stories of the planting of the glove and other evidence. Blacks believed the DNA evidence was faked and that police planted the physical evidence. These differences were clearly based on experience.

Blacks live in a world where police stop them for “*DWB*” (driving while black), where they are searched and accused falsely, and where they or their friends and family are suspected of and charged with crimes they did not commit—because they are black. These experiences provide the backdrop against which all police actions are evaluated. Why would they *not* believe the

¹⁴⁴ THE TALMUD.

¹⁴⁵ ARTHUR W. COMBS & DONALD SNYGG, *INDIVIDUAL BEHAVIOR* 145 (1959).

evidence could have been planted? Whites, on the average, have no such experiences and, thus, far less reason to suspect the police might be untrustworthy.

As the wisdom of the Talmud suggests, who we are is inextricably woven into what we see and later into what we remember of it.

b. Expectations

Further, *expectations* may affect interpretation. For example, returning to our earlier example of the man and woman, if you knew the man in question and thought he was a hostile or aggressive person, or perhaps thought that he did not like the woman in question, these expectations could lead you to see his actions as being consistent with your preconceptions of him.

Generally, expectations may be based in part on stereotypes that, for example, may cause you to perceive the action of a member of one race differently than the exact same action by a member of another. Your impressions of a particular person (such as in the above example) or your expectations for the situation in which the event occurs (for example, if you saw the same physical actions of taking the woman's arm in the man's hand in a romantic restaurant on Valentine's day versus in a dark alley) can greatly affect perceptions of the event.

Expectations can also influence sensory perceptions. This is illustrated by the relationship between color and taste or smell. We have learned through experience to associate objects of particular color with specific tastes, such as lemon with yellow or cherry with red. In effect, the color leads to the *expectation* of a particular taste. That expectation can interfere with the experience of taste when the actual taste is inconsistent with expectations generated by the color of the food or drink. For example, when Arnold Hyman¹⁴⁶ asked subjects to identify the taste of samples of white birch beer, he found that subjects correctly identified it 70% of the time if the samples were colorless. However, when colored red, accuracy dropped to 25%. Some subjects reported that the red-colored beer tasted like cherry cough medicine, cherry soda, mint flavor, or dentist's mouthwash.

¹⁴⁶ Arnold Hyman, *The Influence of Color on the Taste Perception of Carbonated Water Preparations*, 21 BULL. PSYCHOL. SOC. 145 (1983).

Similarly, C. N. DuBose and his colleagues¹⁴⁷ found that the tastes of cherry, orange, and lime beverages were judged correctly an average of 67% of the time if the colors matched their beverages' taste, but only 37% of the time if they were colorless or color did not match actual taste. Analogous results have been obtained with smell, such that when colors and odors match expectations, subjects are better at identifying the odor.¹⁴⁸

c. Motivation, Interests, and Current Goals

*"A clear conscience is often the sign of a bad memory."*¹⁴⁹

Interpretations are biased by *motivation*, including prominently those of self-protection and self-interest. This principle has been documented repeatedly by research showing that our own motivations distort perceptions of the entire world around us, from simple objects to complex human events. Cognitive processes are affected at all stages by motivation, from initial perceptions to later memories.

That is, these motives can affect both the *interpretation* (encoding) of events as they happened and constructive and reconstructive processes occurring later. These possibilities are discussed further in the section on contamination between witnesses.

Further, the jury will not understand that *motivation* can actually distort memory, as opposed to simply provide an incentive for dishonesty. The jury will be more adequately equipped to evaluate the potential for motivations that may lead to deliberate false testimony. However, they would be unlikely to sufficiently understand the potential for motivation to affect encoding and memory processes.

d. Characteristic Criteria for Categorizing and Evaluating the World

Interpretations may be biased by the person's *individual characteristic criteria* for evaluating the world and the people in it.

¹⁴⁷ C.N. DuBose et al., *Effects of Colorants and Flavorants on Identification, Perceived Flavor Intensity, and Hedonic Quality of Fruit-Flavored Beverages and Cake*, 45 J. FOOD SCI. 1393 (1980).

¹⁴⁸ Richard G. Davis, *The Role of Nonolfactory Context Cues in Odor Identification*, 30 PERCEPT. PSYCHOPHYS. 83 (1981); Debra A. Zellner et al., *Influence of Color on Odor Identification and Liking Ratings*, 104 AM. J. PSYCHOL. 547 (1991).

¹⁴⁹ ROBERT BYRNE, *THE 2,548 BEST THINGS ANYBODY EVER SAID* (1996).

For example, a person who considers agreeableness to be one of the most important things about people would be more likely to interpret the man's action (in our earlier example) in terms of either hostility or affection. Another, who thinks of people more in terms of intensity or level of engagement may have assumed the man was "serious" or that he "really cared" about what they were discussing.

e. Self-Schemas

*"It is not as ye judge that ye shall be judged, but as you judge yourself so shall you judge others."*¹⁵⁰

Substantial evidence exists suggesting that people possess organized, generic concepts of themselves termed "*self-schemas*." Dimensions central to the self-concept tend to be used for evaluation of others and their actions. We tend to notice and remember characteristics and behaviors related to these traits in others and give greater weight to them in forming impressions of others. We tend to use ourselves as reference points for evaluation of others.

V. STORAGE

"*Storage*" refers to the process by which recollections are kept in long-term memory. The term *retention interval* refers to the amount of time between the time the event is witnessed (encoded) and the time it is retrieved. During this time, memory may be compromised by several factors. The most prominent factors are: (1) the simple passage of time, during which memory tends to decay; and (2) other information acquired during the storage interval.

A. TRANSIENCE AND SIMPLE DECAY

Memory for information typically becomes less accessible over time, particularly information that is not revisited and rehearsed.¹⁵¹ Daniel Schacter¹⁵² labeled this phenomenon "*transience*" and called it the first of the seven "*sins*" of memory.

¹⁵⁰ HARRY S. SULLIVAN, CONCEPTIONS OF MODERN PSYCHIATRY 349 (1947).

¹⁵¹ Robert A. Bjork, *Retrieval Practice and the Maintenance of Knowledge*, in PRACTICAL ASPECTS OF MEMORY: CURRENT RESEARCH AND ISSUES, VOL. 1: MEMORY IN EVERYDAY LIFE 396-401 (M. M. Gruneberg & Morris eds., 1988); Wilma Koutstaal et al., *Post-Event Review in Older and Younger Adults: Improving Memory Accessibility of Complex Everyday Events*, 13 PSYCHOL. AGING 277 (1998).

¹⁵² Schacter, *supra* note 2, at 182.

Research involving witness memory specifically has clearly documented significantly greater forgetting with longer retention intervals.¹⁵³

As first described in Hermann Ebbinghaus's¹⁵⁴ well-known studies, forgetting tends to occur most rapidly at first and slows down with the passage of time. The "*forgetting curve*" over time is best described mathematically as a power function.¹⁵⁵ The rate of forgetting for real life events, however, varies considerably.

First, memory for the "*gist*" of an event declines much more slowly, if at all, than memory for less central detail.¹⁵⁶ John W. Shepherd found, for example, that although memory for the fact of a hostile encounter with a stranger remained intact, the ability to accurately identify the stranger declined over time (from 65% to 10% after eleven months). Even more disturbing, false identification can escalate as accurate identifications decline.

Second, memory for personally salient events can remain quite stable over time, while that for less important events fades away.¹⁵⁷

Third, memory for very familiar information declines more slowly. For example, H.P. Bahrick and his colleagues¹⁵⁸ found that memory for pictures of high school classmates remained almost perfect after thirty-five years and very good after an average of forty-five years.

Finally, the rate of forgetting depends in part upon the person. Forgetting occurs more quickly in children, for example, than in adults.¹⁵⁹

¹⁵³ Kenneth A. Deffenbacher, *On the Memorability of the Human Face*, in ASPECTS OF FACE PROCESSING 61 (H.D. Ellis et al. eds., 1986); Kenneth A. Deffenbacher, *Forensic Facial Memory: Time is of the Essence*, in HANDBOOK OF RESEARCH ON FACE PROCESSING 563 (Andrew W. Young & Hadyn D. Ellis eds., 1989); Shapiro & Penrod, *supra* note 11, at 139.

¹⁵⁴ HERMANN EBBINGHAUS, *MEMORY: A CONTRIBUTION TO EXPERIMENTAL PSYCHOLOGY* (1964).

¹⁵⁵ John T. Wixted & Ebbe B. Ebbesen, *Genuine Power Curves in Forgetting: A Quantitative Analysis of Individual Subject Forgetting Functions*, 25 MEM. & COGN. 731 (1997).

¹⁵⁶ John W. Shepherd, *Identification After Long Delays*, in EVALUATING WITNESS EVIDENCE 173 (S. Lloyd-Bostock & B. R. Clifford eds., 1983).

¹⁵⁷ DAVID C. RUBIN ED., *REMEMBERING OUR PAST: STUDIES IN AUTOBIOGRAPHICAL MEMORY* (1996).

¹⁵⁸ H.P. Bahrick et al., *Fifty Years of Memory for Names and Faces: A Cross-Sectional Approach*, 104 J. EXP. PSYCHOL. GEN. 54 (1975).

¹⁵⁹ C. J. Brainerd et al., *The Development of Forgetting and Reminiscence*, MONOGRAPHS OF THE SOCIETY FOR RESEARCH IN CHILD DEVELOPMENT 55 (1991); R.

There are some circumstances under which memory can actually become *stronger* over time. When people are repeatedly asked to recall stimuli they have seen (but without suggestions as to what they might have seen), the overall percentage of correct answers tends to increase over time, a phenomenon labeled "*hypermnesia*" by psychologists. This rehearsal seems to both minimize forgetting and promote *consolidation* and recovery of previously unrecalled information. Note, however, that this effect of repeated requests for recall is not equivalent to the effects of suggestive or coercive interviewing.

1. *Buried in Mothballs: The Role of Disuse in Forgetting*

Forgetting over time is greater when the memories are not retrieved and rehearsed in any way.¹⁶⁰ Conversely, retrieving and rehearsing experiences produces better memory over time. For example, some studies have found a positive relationship between the number of interviews with a witness and accuracy.¹⁶¹ However, rehearsal in certain contexts can also serve to distort memory,¹⁶² as subsequent sections will illustrate.

For the majority of civil litigation (including aviation litigation), years have passed between the event and trial, with even greater lag between trial and events leading up to the acute event, such as issues of aircraft maintenance or warnings of dysfunction. In the intervening period, a number of both internal and external influences affect witness memory.

B. INTERFERENCE

Information encountered either before or after the event in question can interfere with memory for the target event, in processes known as *proactive* and *retroactive* interference (discussed earlier in the section on attention and complexity). This interference can occur with respect to information immediately preceding and following the target event and information across

Flin et al., *The Effect of a Five-Month Delay on Children's and Adults' Eyewitness Memory*, 83 BRIT. J. PSYCHOL. 323 (1992).

¹⁶⁰ Koutstaal et al., *supra* note 151, at 277; Schacter, *supra* note 2, at 182.

¹⁶¹ Gail S. Goodman et al., *Children's Testimony About a Stressful Event: Improving Children's Reports*, 1 J. NARR. LIFE HIST. 69 (1991); Ellen Scrivner & Martin A. Safer, *Eyewitnesses Show Hypermnesia for Details About a Violent Event*, 73 J. APPL. PSYCHOL. 371 (1988).

¹⁶² Amye R. Warren & Peggy Lane, *Effects of Timing and Type of Questioning on Eyewitness Accuracy and Suggestibility*, in APPLIED PSYCHOLOGY: INDIVIDUAL, SOCIAL AND COMMUNITY ISSUES 44 (M.S. Zaragoza et al. eds., 1995).

much longer periods of time. In fact, Daniel Schacter¹⁶³ suggests that much forgetting is the result of interference from the many events following the one in question.

Events that are substantially similar can become confused with one another, their separate memories being lost. For example, many visits to a favorite haunt may become blended and indistinct. This phenomenon can become particularly important in the context of litigation. To the extent that a particular action becomes important, blended memories of many similar occasions can severely compromise the accuracy of the testimony.

C. CONSTRUCTIVE AND RECONSTRUCTIVE PROCESSES

*"It isn't so astonishing, the number of things I can remember, as the number of things I can remember that aren't so."*¹⁶⁴

Mark Twain

Recall Nevada politician Seale's testimony that he had feathered the propeller when his engine failed on take-off. Why did he "*remember*" feathering the propeller when the pictures of the cockpit at the scene clearly showed he did not?

Memory research would suggest that Seale's "*memory*" of feathering the propeller derived in part from his *assumptions* about what he would do under those circumstances. He *expected* to feather the propeller, knew he *should* feather the propeller, had *practiced* feathering the propeller during engine out maneuvers, and therefore, he *assumed* he must have done it when the time came. Seale's memory was "*constructed*" from the combination of the actual experience and his preexisting expectations and assumptions about what he would and should do.

Alterations in memory caused by preexisting expectations and knowledge (such as in Mr. Seale's case) or by new information acquired after the fact are what memory researchers refer to as "*constructive*" and "*reconstructive*" memory processes.

1. *Constructive Processes*

*"Out of a few stored bone chips, we remember a dinosaur"*¹⁶⁵

Constructive processes refer to the tendency to *elaborate* on what was originally perceived, such that other information is ad-

¹⁶³ SCHACTER, *supra* note 2, at 72.

¹⁶⁴ Mark Twain as quoted in WITNESS FOR THE DEFENSE by E. Lotus and K. Ketchum.

¹⁶⁵ ULRIC NEISSER, COGNITIVE PSYCHOLOGY 285 (1967).

ded to the original memory. The tendency to add “*default assumptions*” discussed earlier, for example, is one form of constructive memory process. Information added to memory through constructive processes most commonly comes from two sources.

a. Schema-Based Inferences

Constructive processes result in part from the tendency of the person to draw inferences from the information or event that they did see, and to remember the inferred additions as if they were real. Often these inferences are based on expectations, stereotypes, personal desires, and so on—all of the same factors that can lead to biased interpretation during encoding.

For example, imagine a person who has watched a scene where two persons enter a restaurant, sit down at a table, order, and eat. The film did *not* show the waitress offering the guests a menu or show them looking at one. Many people who watch such a scene will later remember inaccurately that they *did* see the waitress offer the menu (and that the guests looked at it) before ordering. They do so in part because their expectations for what happens in restaurants include the idea that guests will be offered and use a menu.

Constructive memory processes in which persons *add* information to the memory of an event they witnessed have been demonstrated from information as simple as a list of words that are related to a word not presented to information as elaborate as a complex enactment of a crime.¹⁶⁶

It is important to note that persons with a more highly developed schema or script for a particular situation tend to be more susceptible to constructive and reconstructive memory processes for that situation. Although “*experts*” will generally be better able to understand and interpret what they see, they also have more developed and powerful expectations that may engage constructive or reconstructive processes of both perception and memory. This will be especially true when the observer was not paying full attention during the event. Whereas an expert observer might notice inconsistencies with what (s)he expects when paying full attention and remember them later, that same expert may fail to notice inconsistencies when devoting minimal attention, thus allowing their schema- or script-based expectations to fill in miss-

¹⁶⁶ SCHACTER, *supra* note 2, at 101; Schacter, *supra* note 2, at 182.

ing information through constructive or reconstructive processes later on.

b. Influence

Constructive processes may also occur because additional information about an event that is acquired *after* the original encoding essentially becomes confused with the memory of the original event. This information may later be remembered as if it had actually been witnessed.

In the eyewitness literature, this phenomenon has been illustrated through studies of various ways in which witnesses are exposed to other information or accounts of a crime, such as newspaper reports, the accounts of other witnesses, interviews by police, counselors and so on. Laboratory demonstrations of such phenomena have examined witnesses who have been exposed to new information (that they did *not* personally witness) about an event they did earlier witness. These witnesses sometimes later remember falsely that they had actually personally witnessed the new information. In other words, we cannot always distinguish between what we have *actually seen for ourselves* and what we *believe we have seen* because we have heard (from other sources) that it was there. These tendencies will be discussed and documented in more detail under "*Vagaries of Source Monitoring*," below.

2. *Reconstructive Processes*

Reconstructive memory processes refer to *changes* in memory as a result of information acquired after the original encoding. Like constructive memory processes, reconstructive processes result from both *inferences* of what would probably be the case given the new information and *influence* from others who might promote a particular interpretation. Such reconstructive processes have been well documented both in the general memory literature and in the eyewitness memory literature in particular.

Returning to the earlier illustration of the man gripping the woman's arm, imagine that the witness had seen this event with no idea of who the two people were or of the nature of the relationship between them. Subsequently, the witness learns that the woman was murdered later that night, and that the man is a suspect. Research on reconstructive memory processes would suggest that many witnesses in such a situation would "*recon-*

struct" their memories of the original event such that the man would appear more angry or violent, the women more afraid, and the event as essentially more hostile in nature than those who did not later learn of the murder.

Claudia Cohen illustrated this process in a classic study.¹⁶⁷ Participants watched a videotape of a woman interacting with her husband. The video portrayed many of the woman's attributes, behaviors and appearance. Of these, some were consistent with the stereotype of librarians, but inconsistent with the stereotype of waitresses (e.g., wears glasses, listens to classical music). Others were consistent with the waitress stereotype, but not the librarian (e.g., affectionate with her husband, drinks beer rather than wine).

Subjects were divided into four groups. Half were told that the woman was a waitress and half that she was a librarian. For each of these groups, half were told her occupation *before* seeing the videotape and half *after*. Later, memories for the woman and her actions in the tape were assessed.

The results clearly demonstrated the biasing effects of expectations activated either when information is first perceived or when activated later. Those who were told the woman was a waitress tended to remember her appearance and behavior as more consistent with a waitress stereotype (e.g., blond hair, drinks beer, affectionate with her husband, listens to rock and roll, etc.), whereas those told she was a librarian tended to remember librarian consistent behaviors and attributes (e.g., brown hair, drinks wine, listens to classical music, etc.).

Many subsequent studies have shown similar reconstructive effects of information acquired after the fact.

a. Post-Event Sources of Information/Schematic Activation

The typical witness does not remain an inviolate repository, storing an exact replica of the events in question. Instead, from the first moments of the relevant events, witnesses are exposed to constant sources of influence on their memories. These sources range from interviews or interrogations by police, attorneys, or other investigators to conversations with friends, family, therapists or other witnesses, to media publicity. Each of these sources may provide additional true information not originally

¹⁶⁷ Claudia E. Cohen, *Person Categories and Social Perception: Testing Some Boundaries of the Processing Effects of Prior Knowledge*, 40 J. PERS. & SOC. PSYCHOL. 441 (1981).

observed by the witness or misleading false information. They may offer interpretations that activate particular schemas and engage constructive or reconstructive processes.

Constructive and reconstructive memory processes lead to alterations or additions in memory outside the awareness of the witness. When later asked to retrieve memories, the witness may suffer a phenomenon called "*source confusion*," as a result of which (s)he cannot accurately remember where the information in the memory comes from (for example, from his or her original observations versus from subsequent media publicity).

Recently, prominent memory expert Elizabeth Loftus¹⁶⁸ has offered an account of media and other potentially biasing influences on eyewitness reports of the intensely publicized crash of TWA Flight 800 on July 17, 1996. Her description of the history of witness reports in that case illustrates the power of reconstructive processes to shape witness memory.

Within days after the crash, the media began to present and discuss the theory that the plane had been shot down by a missile. Media reports of the "*missile theory*" included graphics illustrating how the missile shooting may have occurred and reports of witnesses who saw "*a flare*" streaking toward the plane immediately preceding the explosion. In one witness report, a National Guard helicopter pilot flying in the area during the time of the crash reported seeing a streak of red-orange light ending in a small explosion followed by a larger explosion turning into a huge fireball descending slowly into the ocean. His observations were broadcast on Rivera Live (CNBC, July 19) two days after the crash.

Three days after this broadcast, ten more unnamed witnesses reported seeing something streaking toward the plane before the explosion. This "*missile*" theory was pursued and continuously discussed in the media for much of the next year.

The testimony of pilot Meyer and his co-pilot Baur became crucial in the investigation of the crash. However, as Loftus and G. Castelle¹⁶⁹ describe in detail, both were subjected to a number of post-event sources of influence. These included media publicity of the missile theory, conversations between the pilots and crew of the helicopter, repeated questioning by media and

¹⁶⁸ Elizabeth F. Loftus & George Castelle, *Crashing Memories in Legal Cases*, in *RATIONALITY, INFORMATION AND PROGRESS IN LAW AND PSYCHOLOGY* 207 (Peter J. Van Koppen & Nikolas Roos eds., 2000).

¹⁶⁹ See *id.* at 207.

investigators, and the use of questionable memory recovery techniques such as hypnosis, guided imagery and relaxation techniques.

The pilot Meyer reported recovering a fully detailed memory of the missile impact in a dream. In fact, however, there is no evidence that dreams reliably replay real memories. The co-pilot "*remembered*" the missile impact for the first time after the use of hypnosis, guided imagery and relaxation, and well after exposure to media accounts and repeated conversations with investigators and the pilot Meyer (the one who had first described seeing events consistent with the theory of an oncoming missile and impact). The reports of each changed as time went on, becoming more explicit and more consistent with the possibility of a missile attack. Not surprisingly, the confidence of these witnesses in their reports increased along with the changes.

By October 1997 (more than one year after the crash), the NTSB had identified 183 witnesses who claimed to have observed a streak of light prior to the explosion of the plane. Did each of the 183 witnesses who eventually reported seeing the streak leading toward the plane actually see it? Or did pilot Meyer and the media reports of the missile theory influence them? Did they actually see a moving streak? Or did they see the trace well after it was stationary and "*reconstruct*" the direction based on the missile theory?

Ultimately, the CIA concluded that the crash was not caused by missile attack. They prepared an elaborate video simulation of the real cause of the crash, explaining that the plane could have briefly ascended after an explosion blew off the nose causing the ascending streak seen by the witnesses. Nevertheless, many witnesses and much of the general public remained unconvinced, doubtlessly believing to this day that the plane was brought down by a missile.

Clearly, media and other post-event sources of information influence memory through reconstructive processes. Once accomplished, these reconstructive changes can be highly resistant to influence. Embedded in a host of beliefs and other information that make them seem not only real but also plausible (or even logically necessary), the new "*memories*" can become virtually unassailable.

Research documenting these effects and typical post event sources of these effects will be discussed in Section XIII.A(2) *infra*. Meanwhile, we return to consideration of other reconstructive influences.

b. Memory In Retrospect

"[M]emory, the would-be anchor of selves and lives, constructs the materials from the past that an earlier, more innocent view would have us believe it merely stored."¹⁷⁰

One of the most powerful causes of reconstruction in memory is present knowledge. Several lines of research have documented the influence of present beliefs on memories of our past behaviors, experiences and beliefs. Generally, this research has shown that we tend to believe that our past beliefs, behaviors, and experiences are more *consistent* with our current beliefs than they actually were.

1. The "Retrospective Bias"

Studies concerned with the "*retrospective bias*" have shown that reports of past attitudes or behaviors are biased by current attitudes or recently acquired information. Recollections of past political attitudes, for example, tend to be distorted significantly by current political beliefs.¹⁷¹ Similarly, recollections of one's own behavior have been shown to change to conform to newly acquired information about how one *should* behave. In other words, we reconstruct memory of the past so that we believe we behaved in a more sensible or desirable way than we actually did. These kinds of distortions toward consistency have long been known to survey researchers with interest in past behavior, and underlie the common recommendation to have respondents, when possible, consult records before answering questions regarding the past.

How could the "*retrospective bias*" become important in litigation? Generally, both tragic events and the lawsuits that follow them tend to identify actions we *should have taken* but did not, and those we *should not have taken* but did. The retrospective bias would tend to lead us to misremember our actions as more correct and desirable than they actually were. Just as self-protective motivations may lead to deliberately false testimony, the retrospective bias may cause "*honest*" false testimony.

¹⁷⁰ Eakin, *supra* note 4, at 291.

¹⁷¹ Robyn M. Dawes, *Biases of Retrospection*, 1 ISSUES CHILD ABUSE ACCUSATIONS 25 (1991); Linda J. Levine, *Reconstructing Memory for Emotions*, 126 J. EXP. PSYCHOL. GEN. 165 (1997).

2. "Hindsight is 20/20," or Is It?

Just as the proverbial Monday morning quarterback is certain he could have predicted the outcome of the "Hail Mary" pass lofted in the final moments of the playoff game, human observers typically feel they could have predicted the outcomes of everyday events, such as a neighbors' divorce, a political election, a business investment, career choices or foreign policy decisions. Past events appear simple, comprehensible, and predictable in comparison to the events of the future. This tendency to believe, in hindsight, that we knew in foresight that particular events or actions would lead to specific outcomes is called the "*hindsight bias*."¹⁷²

Once an outcome is known, victims of this "*hindsight bias*" have been shown to not only overestimate, in hindsight, how likely that particular outcome was to occur, but to also overestimate what others could have or should have anticipated in foresight, thus giving them undue credit or blame for the outcome. Further, blissfully ignorant of their own hindsight biases, they cannot accurately remember their own judgments or behavior *before* the outcome was known, recalling instead that they were wiser ("*I knew it all along!*") and more confident ("*And I was sure of it!*") and that their behavior was more consistent with that knowledge ("*I told you that would happen*" or "*I checked that seal before we took off*") before the event than was actually the case. Finally, having rewritten the history of their judgments and thus not acknowledging their mistakes, victims of hindsight feel less need to reevaluate and improve their decision-making processes and evidence-gathering strategies and therefore do not learn effectively from their errors.¹⁷³

Baruch Fischhoff¹⁷⁴ called this tendency to perceive past events as inevitable consequences of their predecessors "*creeping*

¹⁷² Baruch Fischhoff, *Hindsight Does Not Equal Foresight: The Effect of Outcome Knowledge on Judgment Under Uncertainty*, 1 J. EXP. PSYCHOL. HUM. PERCEPT. PERFORM. 288 (1975); Baruch Fischhoff, *Perceived Informativeness of Facts*, 3 J. EXP. PSYCHOL. HUM. PERCEPT. PERFORM. 349 (1977); Baruch Fischhoff, *For Those Condemned to Study the Past: Heuristics and Biases and Hindsight*, in JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES 162 (Daniel Kahneman et al. eds., 1982).

¹⁷³ Deborah Davis, *What Would I Think If I Didn't Know the Patient Died*, in FROM THE MIND'S EYE 1 (Deborah Davis ed., 1991); Scott A. Hawkins & Reid Hastie, *Hindsight: Biased Judgments of Past Events After the Outcomes Are Known*, 107 PSYCHOL. BULL. 311 (1990).

¹⁷⁴ Fischhoff, *Hindsight Does Not Equal Foresight*, *supra* note 171, at 288; Fischhoff, *Perceived Informativeness of Facts*, *supra* note 171, at 349; Fischhoff, *For Those Condemned to Study the Past*, *supra* note 171, at 162.

determinism.” In other words, in retrospect, we seem to perceive the past as a sequence of events that follow logically from one another. Since the outcome is perceived to follow logically from events preceding it (determinism), we develop the perception that no other outcome was possible under the circumstances, that we knew it all along, that we were behaving accordingly, that others should have known it too, and that because they should have known better, they are responsible for any negative outcomes of their actions.

A number of studies have examined the implications of this “*hindsight bias*” in the legal system. Some of the focus of this research has simply been the fact that *judgments* in hindsight can be inappropriately harsh because people blame themselves or others for making the wrong decision even though in foresight the decision made sense based on the information available at the time. For example, several studies showed that judgment of medical and financial decisions and of behaviors on a date are affected by knowledge of the outcome. The exact same actions, judged without knowledge of the outcome, are viewed as more competent or appropriate in foresight. In hindsight, however, if the patient died, the money was lost, or the girl was raped, the same behaviors are judged as incompetent or inappropriate. Thus, many lawsuits and verdicts may be caused by harsh judgments in hindsight.¹⁷⁵

However, the effects of hindsight also include reconstructive memory processes. That is, the *outcome* (or result) of a behavior that took place in the past is a new piece of information that can cause reconstructive memory processes in the same way as any other new information. In this case, as with other new information, memory is altered so that the previously stored information is changed to appear more consistent with the new information. If the outcome is negative, for example, the observer may reconstruct the memory of the behaviors leading up to the outcome (such as conversations, precautions, information searches and so on) such that they appear more inappropriate or inadequate. On the other hand, one’s own behavior may be reconstructed to appear more appropriate.

Interestingly, one of the first studies of hindsight in the legal setting dealt with biases in *production of evidence* rather than in reactions to it. That is, rather than biases in judgments of the

¹⁷⁵ Davis, *supra* note 172, at 1.

jury and judiciary, it dealt with distortions in witnesses' recollection of the events preceding the outcome at issue in trial.

a. John Dean and the Watergate Cover-up

*"I began by telling him there was a cancer growing on the Presidency,
and that if the cancer was not removed, the President himself
would be killed by it."*

John Dean¹⁷⁶

Once the Watergate cover-up failed and President Nixon and his staff became the target of Watergate investigators, John Dean confidently reported that he had known all along that the cover-up would fail and that Nixon would be in jeopardy as a result. Was this confident assertion just an example of the hindsight bias in operation, or did Dean actually foresee the outcome and warn the president?

Cognitive psychologist Ulric Neisser¹⁷⁷ analyzed the portion of John Dean's testimony during the Watergate hearings recounting his conversations with the President. This analysis provided an ideal opportunity to examine the effects of hindsight on recall. Unlike most evidentiary situations, Dean's testimony could be compared to an objective record of the events in question—i.e., the subsequently released recording of his conversations with the President.¹⁷⁸

Neisser traced many errors in Dean's testimony to events subsequent to the conversations he recounted, clearly demonstrating that Dean's testimony concerning events prior to exposure of the cover-up was biased by his knowledge of later events. Dean claimed, as quoted above, that he had warned Nixon of the danger of exposure of the cover-up which hindsight clearly exposed as dangerous and of the consequences for Nixon himself that were also confirmed in hindsight, although the tapes later revealed that he had given no such warnings. Dean reported with likely absolute belief in their verity things that *should* have occurred given his hindsightful knowledge of the outcomes.

Such objective comparisons of testimony with fact are, unfortunately, rare. However, studies of the biasing effects of hind-

¹⁷⁶ *Hearings before the Select Committee on Presidential Campaign Activities of the United States Senate*, 93d Cong. 988 (1973).

¹⁷⁷ Ulric Neisser, *John Dean's Memory: A Case Study*, in *MEMORY OBSERVED: REMEMBERING IN NATURAL CONTEXTS* 263 (Ulric Neisser ed., 1982).

¹⁷⁸ JOHN DEAN, *THE PRESIDENTIAL TRANSCRIPTS* (1974).

sight, and of retrospective biases in general, on memory suggest that distortions due to hindsightful knowledge of subsequent events will be pervasive.

Civil litigation routinely involves lengthy sequences of events involving many people leading up to a particular outcome. Aviation litigation, in particular, often involves testimony reaching back twenty years or more, covering the design and manufacture of the model aircraft involved, the history of its ownership and maintenance, the actions of owners and maintenance personnel covering the period before the crash, and the actions of ground personnel, crew, passengers and others immediately preceding the crash.

Hindsight will distort testimony among many, if not most, such witnesses. Some will remember the status of the plane as more dangerous in hindsight than they perceived in foresight. Others will remember that they performed maintenance and inspection procedures that they should have but did not. Passengers may remember that they asked the pilot about maintenance and were reassured, as in our Nevada case, whether they did or not. The pilot may remember that he performed appropriate emergency maneuvers that were never done, as when Nevada's state politician Seale "*remembered*" that he feathered his propeller when his engine failed although he did not. In many ways, through many voices, hindsight will permeate the fabric of the case.

D. COLLABORATION/INFLUENCE BETWEEN WITNESSES

The first author recently testified in the trial of Mr. Strode, a man accused of an Oregon bank robbery. The perpetrator was described to police over the phone during the initial report of the robbery. As police operators were asking for a description, they were told to wait, "*We're getting a consensus on that.*" The witnesses continued to discuss the proper description of the perpetrator, and finally provided a description of an Asian or Hispanic man with long black hair wearing a running suit. They provided estimates of height and weight and a description of the suit.

Police then picked up the only dark skinned man who could pass as Asian or Hispanic in the area, although he was not in a jogging suit, and brought him to the bank. The defendant was made to stand in front of the police car outside the window of the bank for witnesses to identify. As soon as she saw him, the

teller who was robbed burst into tears and collapsed on the floor.

How should we interpret the testimony of the bank witnesses? Should we trust the initial description arrived at after resolving any individual differences through discussion? How might the other witnesses have been influenced by the reaction of the teller? Similarly, how should we interpret the testimony of helicopter co-pilot Baur from the TWA case (or the other 183 ground witnesses) in light of their exposure to pilot Meyer's testimony through his media appearances and to the accounts of both Meyer and other witnesses through descriptions from media reporters? Social science research would indicate that we should be wary. The way in which influence may occur between witnesses is amply documented in the social science literature.

The potential of people to influence one another's judgments is well documented in a well-known series of studies on conformity conducted by Solomon Asch in the 1950's. Generally, the method employed in Asch's original research and that of those who followed was to expose subjects to a stimulus of some sort and ask for a judgment. The judgment could be objective, such as the length of a line, distance between points of light, height, etc. or subjective, such as the quality of a work of art, pleasantness of taste, and many more. The subjects were asked for their judgments under various conditions of potential for group influence.

Typically, conditions with high potential for influence, such as when others have announced their judgment first, when the subject must announce his or her judgment in front of the group, when the subject is less sure of his or her own judgment, etc., are contrasted with those with less potential, such as when the subject announces his or her judgment without knowing the judgment of others, when the subject's judgment can be made anonymously, when the subject is more expert than the others, etc. Uniformly, these studies have found that subjects' judgments are influenced by the judgments of others. Further, they are more influenced by the judgments of those they perceive as: (a) more expert than they are, or particularly credible for any reason; (b) well-liked; or (c) part of their own in-group. Subjects are also more influenced on judgments of stimuli where they are uncertain of their own judgment.

It is important to note that when subjects announce their judgment when they know of others' judgments, they announce judgments different from those they make when judging alone.

This occurs for two reasons. First, they are sometimes unsure of the correct answer and use others' judgments as a source of information about what is true. Second, they sometimes conform just to please others or avoid social rejection.

It is also important to note the extremity of distortion that can result from knowledge of others' judgments. In the original studies of this topic, Solomon Asch had groups of subjects judge the length of lines. He exposed subjects to a target line (on one presentation card) and three comparison lines (on another card). The subjects' task was to choose which comparison line matched the target line. Asch constructed the comparison lines such that the task was very easy. There was no doubt of the correct response. When subjects did this task alone (for twenty-four comparisons), the error rate was practically zero.

However, Asch set up another condition where he had varying numbers of confederates announce incorrect judgments on eighteen of twenty-four trials before the subjects' turn. Among subjects who heard the incorrect responses from others, only 10% remained free of error. A full 90% of the subjects gave incorrect responses on at least one of eighteen possible trials, and 25% responded incorrectly on all trials.

Asch's results were impressive because: (a) virtually no subjects completely resisted the influence of what they could clearly see were false judgments of others; and (b) so many subjects completely succumbed to that influence. Asch's findings have been replicated over and over in many studies that followed.

These findings have also been replicated in the context of jury decision-making, where it has been shown that when jurors take a show of hands to vote on guilt there is substantial conformity to others. A show of hands is more likely to result in an immediate verdict than an anonymous poll because jurors who might otherwise maintain a minority opinion are swayed by the knowledge of the majority opinion.

The social influence and conformity literature has conclusively demonstrated the power of social influence to alter reported judgments. Additionally there is direct evidence from the eyewitness literature demonstrating that co-witnesses can influence both the accuracy of one another's testimony as well as their confidence in those accounts. For example, Elizabeth Loftus and Edith Greene¹⁷⁹ (1980) found that participant-witnesses

¹⁷⁹ Elizabeth F. Loftus & Edith Greene, *Warning: Even Memory for Faces May be Contagious*, 4 LAW AND HUM. BEHAV. 323 (1980).

incorporated misleading details from other witnesses' written descriptions into their own descriptions of target faces. More recently, Wright, Self and Justice,¹⁸⁰ demonstrated that other witnesses can influence memory for cars, and Betz, Skowronski, and Ostrom¹⁸¹ have demonstrated that bogus responses of others can influence people's later memory reports for details from a written story.

These memory studies focused on *later* reports from a witness after that witness had already been exposed to co-witness statements. However, there is also evidence for *immediate* effects of co-witness reports. Perhaps the clearest demonstration of these efforts can be seen in a series of three studies by Shaw, Garven and Wood.¹⁸² In the first study, student witnesses were questioned in ways that were intended to be analogous to the experience of a witness who receives information from an interviewer or questioner about what other witnesses have already said. A second and third study simulated the situation where witnesses received the information directly from co-witnesses. In all three studies, witness reports were significantly affected by information about the reports of other witnesses, whether they received the information directly from the co-witnesses or indirectly from the interviewer.

Further, the experimenters varied whether the interviewer conducted the interview in a misleading way by suggesting particular incorrect responses. The misleading interview questions created more errors in witness reports. The most errors, however, were committed by witnesses who received incorrect information both directly from other witnesses *and* indirectly via the misleading questions of the interviewers. These results suggest that discussions between co-witnesses have great potential to influence the testimony of all of the witnesses. When interviews by police or other investigators suggest information similar to that being conveyed by other witnesses, a target witness will be particularly likely to adopt the suggested account.

The potential for immediate influence between witnesses has far reaching consequences. They not only shape one another's initial reports. A witness' first statements have been shown to

¹⁸⁰ Daniel B. Wright et al., *Memory Conformity: Exploring Misinformation Effects When Presented by Another Person*, 91 BRIT. J. PSYCHOL. 189 (2000).

¹⁸¹ Andrew L. Betz et al., *Shared Realities: Social Influence and Stimulus Memory*, 14 SOC. COGN. 113 (1996).

¹⁸² John S. Shaw III et al., *Co-Witness Information Can Have Immediate Effects on Eyewitness Memory Reports*, 21 LAW & HUM. BEHAV. 503 (1997).

shape that witness' later reports during subsequent interviews or court appearances. In other words, once a witness has told his or her version of what happened, that witness is likely to stick with that account in the future. Loftus¹⁸³ has referred to this phenomenon as the "freezing effect." As time goes by, it becomes increasingly difficult for a witness to change or back down from an initial statement or identification. The pressures to continue to be consistent can overwhelm virtually any witness.

Further, the first statements of even a single witness may influence the subsequent investigation of a case, just as helicopter pilot Meyer's initial report of the TWA explosion triggered the "missile theory" of the crash and thousands of hours of investigation of that theory, and influenced countless reports of witnesses who heard Meyer's account on TV before being interviewed themselves. Similarly, based upon one witness's initial account of a criminal incident, the police may construct a lineup, choose particular mug shots, interview specific witnesses, formulate detailed theories about the commission of the crime, and even make an arrest. Thus, even minor errors, misstatements, or omissions in one witness's initial memory report can have far reaching effects on the investigation of the case,¹⁸⁴ whether civil or criminal.

1. *Inflation of Witness Confidence Through Collaboration/Corroboration*

We have discussed earlier how witness confidence is minimally associated with witness accuracy. Thus, it is important to point out that witness confidence can be inflated through discussions with other witnesses and the knowledge that they agree with the witness's own account of the events in question. For example, Luus and Wells¹⁸⁵ showed that *confidence* became inflated in witnesses who knew another witness made the same perpetrator identification. They staged a theft in front of seventy pairs of witnesses. Witnesses who were told that their co-witness identified the same person they had identified showed an increase in confidence in their identifications, as expressed to an ostensible police officer. Those who thought their co-witness disagreed showed deflation of confidence.

¹⁸³ ELIZABETH F. LOFTUS, EYEWITNESS TESTIMONY (1979).

¹⁸⁴ Shaw III et al., *supra* note 181, at 503.

¹⁸⁵ Luus & Wells, *supra* note 16, at 714.

Luus and Wells then showed tapes of the seventy witnesses to other mock jurors who judged the credibility of their testimony. Witnesses who had heard that other witnesses agreed with their identifications were judged as more credible by the mock jurors than those who had heard that other witnesses had disagreed or who had not been given any information. In other words, witness confidence was affected by information about the opinions of other witnesses, and the witnesses' confidence, in turn, affected mock jurors' judgments of their credibility.

Finally, it is important to point out that social influence between witnesses may occur due to both the influence of the *information* conveyed between them and the potential for *motivational* distortions in memory created by any desire they may have to avoid rejection or to help or support others, whether it be other fact witnesses, investigators, or parties to the case. To the extent this motivation exists, it would tend to both distort their own memories in the direction consistent with the interests of the other person and to render them more susceptible to the influence of any source who might be reporting the events in line with the other's interests.

Expert testimony on issues of witness contamination will be useful since jurors will not understand the potential for witnesses to influence one another's memories. Jurors will also not understand that collaboration among witnesses will inflate their confidence. Instead, jurors will tend to assume the inflated confidence the witnesses may display means they are accurate.

VI. RETRIEVAL PROCESSES

"[E]ven the seemingly simple act of calling to mind a memory of a particular past experience . . . is constructed from influences operating in the present as well as from information you have stored about the past."¹⁸⁶

Even if the witness has accurately encoded and stored information until asked to retrieve and report it, accuracy may still be compromised during the process of retrieval as we attempt to reconstruct our original observations. Recall, we do not store a precise record of what we observe. We store bits and pieces that provide the basis for reconstructing the event much like, as Neis-

¹⁸⁶ SCHACTER, *supra* note 2, at 8.

ser¹⁸⁷ suggested, the paleontologist reconstructs a dinosaur from fragments of bone.

However, just as the paleontologist's reconstruction is part fact and part inference, so are the memories we reconstruct when asked to retrieve them. Particularly when the real memories of the event are not clear, our reports of them become susceptible to a wide variety of influences.

A. CONFIDENCE AND COMMITMENT ENHANCING PROCESSES

Recall our earlier discussion of the impact of witness confidence on juror belief in the witness' testimony. Processes associated with retrieval of memories can have profound effects on the content of witness testimony as well as the confidence of the witness. These processes include both post-event interviews and discussions with other witnesses, police, investigators and attorneys, as well as specific memory retrieval techniques designed to enhance retrieval of difficult or lost memories.

1. *Confirmatory Feedback*

Among the processes that lead to enhanced confidence is feedback suggesting that witness reports are correct. Gary Wells and Amy Bradfield¹⁸⁸ illustrated this problem in the eyewitness identification context, where police often praise witnesses who have identified a suspect for having picked the right one. As the authors note, the witness' confidence will be inflated by feedback that (s)he identified the same suspect police believe to be guilty.

Similarly, confirmation is provided by police for other aspects of witness reports and by attorneys and other witnesses among others. All confirmatory feedback has the potential to both artificially inflate confidence and to interfere with any true but contradictory memories the subject may have had.

2. *"Illusory Truth" Through Repeated Rehearsal, Questioning or Recounting*

In legal settings, once something is witnessed or experienced, memories of the event are typically retrieved repeatedly as the witness thinks about what happened. Particularly when the

¹⁸⁷ NEISSER, *supra* note 164, at 285.

¹⁸⁸ Gary L. Wells & Amy L. Bradfield, "Good, You Identified the Suspect": Feedback to Eyewitnesses Distorts Their Reports of the Witnessing Experience, 83 J. APPL. PSYCHOL. 360 (1998).

event is unexpected, before a witness recounts them even for the first time, the memories are continually “constructed” by the witness’ efforts to understand and process what happened. Before trial, the average witness will have retrieved and reported relevant memories countless times for many different audiences, ranging from other witnesses on the scene to police interviewers, friends, family, counselors, corporate employees, doctors, attorneys, media, and many others. On each of these occasions, memory is changed. It may simply begin to seem more certain or real, or details may be added or changed. No matter the nature of the change, it will have the potential to affect the jury’s assessment of the witness.

Even the simple act of repeating a statement can increase the strength of one’s belief in its truth. Memory researchers have dubbed this effect the “*illusory truth effect*.”¹⁸⁹ The effect occurs from the mere act of repetition, even when statements are simply repeated in the laboratory with no implication the statement is true, and out of context, without the personal involvement and very real consequences inherent in case-relevant testimony. How much stronger would such effects become when the other influences around a witness are consistent with the statements being repeated?

A witness may or may not *alter* a memory as a result of recounting. The repeated recounting may simply cause the witness to have increased *confidence* in the memory. However, increased confidence will tend to increase the witness’ credibility, thereby affecting the jury’s reaction to the testimony. More seriously, post-event discussions may substantially alter memory and completely mislead the jury. Thus, whether large or small, the changes in witness memories that come from post-event interviews and discussions are rarely trivial.

a. Preparation for Cross-Examination

Repetition and rehearsal in the context of cross-examination have exceptional potential for enhancing witness confidence. The context of a trial team’s preparation for trial is, by its nature, focused on promoting one point of view. The witness may

¹⁸⁹ Hal R. Arkes et al., *Determinants of Judged Validity*, 27 J. EXP. SOC. PSYCHOL. 576 (1991); Hal R. Arkes et al., *The Generality of the Relation Between Familiarity and Judged Validity*, 2 J. BEHAV. DEC. MAKING 81 (1989); Ian M. Begg, et al., *Dissociation of Processes in Belief: Source Recollection, Statement Familiarity, and the Illusion of Truth*, 21 J. EXP. PSYCHOL. GEN. 446 (1992).

be exposed to the full arguments and evidence for that point of view. Further, with a good trial team, sometimes including trial consultants, the witness may be led repeatedly through expected testimony, practicing direct testimony and how to handle cross-examination. Mere exposure to the arguments and evidence consistent with one's testimony will build confidence, as will the successful experiences of handling mock cross-examination.

VII. FAILURES OF RETRIEVAL

A. THE IMPORTANCE OF CONTEXTUAL CUES FOR RETRIEVAL

*"Recollection is a kind of perception, . . . and every context will alter the nature of what is recalled."*¹⁹⁰

One of the most well-established phenomena in memory research is the fact that our ability to retrieve a memory is strongly affected by the context in which we try to remember. All of us experience this effect every day as memories are constantly triggered by something we see, read, or hear that "*reminds*" us of something associated in memory with what we just encountered. Similarly, we fall victim to failures of memory triggered by contextual features that temporarily block the memory we are looking for, as when we cannot remember one person's name because a recent encounter with a person with a similar name has blocked it. Thus, to understand how retrieval can be either compromised or enhanced, it is important to understand how *context* affects retrieval.

1. *Finding the Path to Memory*

Retrieval of memories tends to occur through associative pathways connecting related information in memory. Forgetting occurs, in part, because as time passes, interference from new information makes it progressively more difficult to find a retrieval cue that triggers the associative pathway.¹⁹¹

a. Start with Cues Associated with the Event

A particular memory can become easier to retrieve if the person is first reminded of related information—a principle called "*context-dependent memory*." This process has been illustrated, for example, in studies of "*cued recall*," showing that providing "*cues*"

¹⁹⁰ ISRAEL ROSENFELD, *THE INVENTION OF MEMORY: A NEW VIEW OF THE BRAIN* 89 (1988).

¹⁹¹ SCHACTER, *supra* note 2, at 77.

related to the information to be retrieved aids retrieval; for example, in studies demonstrating that returning victims to the scene of a crime helps them remember details they could not otherwise remember,¹⁹² that scuba divers can remember lists of words learned in water better when they are again in water than when on land and lists learned on land better when again on land than when in water,¹⁹³ in studies of "*state-dependent learning*," indicating that retrieval is superior when attempted in the same state as the person was in when the information was originally encountered (such as when using drugs or alcohol), and in studies of "*mood-congruent retrieval*,"¹⁹⁴ showing that it is easier to retrieve pleasant memories when in a pleasant mood and unpleasant memories when in an unpleasant mood.¹⁹⁵

b. Interfering Contextual Cues and Memory "*Blocking*"

Just as retrieval may be facilitated by useful contextual cues, interfering contextual cues may also block it. Even if a person has encoded an event deeply and it has not been lost from storage over time, (s)he may be temporarily unable to retrieve the memory. Daniel Schacter¹⁹⁶ included this among his list of seven sins of memory under the name "*blocking*." Very often, memory is "*blocked*" by something in the current context making it more difficult to think of the desired information. Typically, information that tends to block retrieval is related in some way to the information sought as, for example, when the attempt to retrieve one person's name is blocked by another similar name.

Although blocking is usually temporary, it may occur over a longer term. This was illustrated in a witness memory paradigm,¹⁹⁷ where it was shown that repeated retrieval of some aspects of a witnessed event can block retrieval of other related aspects of the event. Participants viewed photographs of a crime

¹⁹² RONALD P. FISHER & R.E. GEISELMAN, *MEMORY-ENHANCING TECHNIQUES FOR INVESTIGATIVE INTERVIEWING: THE COGNITIVE INTERVIEW* (1992).

¹⁹³ Duncan R. Godden & Alan D. Baddeley, *Context-Dependent Memory in Two Natural Environments: On Land and Underwater*, 66 BRIT. J. PSYCHOL. 325 (1975).

¹⁹⁴ Gordon H. Bower, *How Might Emotions Affect Learning*, in THE HANDBOOK OF EMOTION AND MEMORY: RESEARCH AND THEORY 3 (S. Christianson ed., 1992); Susan Mineka & Kathleen Nugent, *Mood-Congruent Memory Biases in Anxiety and Depression*, in MEMORY DISTORTION: HOW MINDS, BRAINS AND SOCIETIES RECONSTRUCT THE PAST 173 (Daniel L. Schacter ed., 1995).

¹⁹⁵ Christianson & Safer, *supra* note 61, at 218; SCHACTER, *supra* note 2, at 211.

¹⁹⁶ Schacter, *supra* note 2, at 182.

¹⁹⁷ JOHN S. SHAW III ET AL., *RETRIEVAL-INDUCED FORGETTING IN AN EYEWITNESS MEMORY PARADIGM* 2 (1995).

scene and then were repeatedly questioned about certain categories of objects in the scene. Subjects were repeatedly questioned about some objects from the category in question but not others. Later, compared to objects in other categories, subjects had poorer memory for the non-reviewed objects in the target category. That is, the repeated retrieval of some objects in a particular category (such as clothes) appeared to block memory for related others that had not been similarly rehearsed.

The implication of this later research is that post-event questioning leading the witness to focus selectively on some aspects of the event can cause difficulty in remembering other details that may be very important.

c. Led Down the Wrong Path: The Effects of Biasing Retrieval Cues

Schacter¹⁹⁸ argued that memory is not simply “cued” by contextual cues; it is shaped and constructed by these cues. He argued that retrieval cues combine with the stored memory “*engram*” to yield “*a new, emergent entity—the recollective experience of the rememberer—that differs from either of its constituents.*”¹⁹⁹

Schacter²⁰⁰ reported an experiment in which college students looked at photographs of people they had heard speak in either a pleasant or irritating tone of voice. Later, they were asked to recall the speaker’s tone of voice. They were cued with photographs of the speaker posing with either a slight smile or slight scowl. Regardless of the actual original tone of voice of the speaker, subjects who were cued with a smiling face were more likely to “remember” a pleasant tone of voice and those cued with a scowling face were more likely to “remember” an irritating tone of voice. In other words, memory was greatly influenced by the retrieval cue, drifting toward consistency with the cue. Similar biasing influence of *questions* as retrieval cues can be seen in studies of the “*misinformation effect*” found in 2.e below.²⁰¹

To summarize, memory is affected in many ways by the contextual cues present during retrieval. These cues may either facilitate or interfere with memory. Thus, it is important for the attorney (or the memory expert) to consider the context in

¹⁹⁸ Schacter, *supra* note 2, at 104.

¹⁹⁹ *See id.*

²⁰⁰ SCHACTER, *supra* note 2, at 70.

²⁰¹ *See infra* Section VII.C(1)(e).

which the memory was retrieved and be aware of the potential for bias.

B. CONFUSING THE PRESENT WITH THE PAST: THE IMPORTANCE OF CURRENT MOTIVATIONS, GOALS, AND BELIEFS

Recall our earlier discussion of the "*retrospective bias*." Current motivations, goals, and beliefs provide powerful cues that both direct retrieval and color interpretation of what is retrieved. In the earlier section, we reviewed evidence that current beliefs and motives cause us to remember the past as more consistent with the present than it actually was.

There is also evidence that present motivation affects this tendency directly through its effect on the ability to retrieve consistent versus inconsistent information. For example, the phenomenon called "*mood-congruent retrieval*," referred to above as affecting retrieval through contextual cueing processes, may also result from *motivated-retrieval processes* or the desire to avoid mood-incongruent memories.²⁰²

C. DISSOCIATION AND THE VAGARIES OF SOURCE MONITORING

On the evening of October 4, 1992, shortly after take-off, an El Al Boeing 747 crashed directly into an eleven-story Amsterdam apartment building. The plane crashed almost straight nose-down, immediately bursting into flames as it fell to the ground. Media coverage never included the crash itself, but began within the first hour after the crash and included films of the ensuing fire and rescue operations. Coverage continued for some time and reached most of the country.

In a study appropriately titled "*Crashing Memories and the Problem of Source Monitoring*," Hans Crombag and his colleagues, Wagenaar, and Van Koppen,²⁰³ examined the memories of Dutch citizens exposed to media accounts of the El Al crash. The authors were interested in the potential for media accounts to cause reasonably intelligent adults to believe they had witnessed the crash they could not actually have seen themselves. Although the crash was not filmed and never shown on TV, many accounts were given in both television and written media. In two separate surveys, ten months after the crash, the authors asked respondents, "Did you *see* the television film of the mo-

²⁰² Bower, *supra* note 193, at 3.

²⁰³ Hans F. M. Crombag et al., *Crashing Memories and the Problem of Source Monitoring*, 10 APPL. COGN. PSYCHOL. 95 (1996).

ment the plane hit the apartment building?" Those who answered "yes" were then asked whether they could remember how long it was until the plane caught fire. Startlingly, notwithstanding the implausibility of the media having caught the moment of the crash on film, more than half of the respondents reported having seen the crash (55% and 66%, in the first and second surveys). Of those who "remembered" seeing the crash, more than 80% "remembered" when the fire started, although some did so incorrectly. Many gave vividly detailed descriptions of the crash they could *not* have actually seen.

Did these Dutch residents really remember seeing the crash? Did they just report what they *believed* happened? If they did remember the crash, how could these pseudo-memories develop, and why did the residents not understand that they were not real? These are the questions examined by memory researchers concerned with the problem of "source monitoring."²⁰⁴

Crombag's²⁰⁵ dramatic illustration of the ease with which we can "remember" things that never were is one among a growing literature documenting the facility with which false memories can be created, and the mechanisms through which they are produced.

Crombag,²⁰⁶ for example, attributed the false "crashing memories" of the Dutch citizens to problems of "source monitoring," or failure to understand *where* the vivid images of the crash they "remembered" came from. The authors argued that the false memories reported by their respondents were based on vivid internal images the respondents had created through imagining the various scenes described in the media. Eventually, experiencing failures of "source monitoring," the respondents confused these internally created images with actual memory for the event.

Crombag²⁰⁷ suggested that source-monitoring failure may be even more common for memories of dramatic, highly publicized events such as a plane crash than for more mundane events. Events tending to provoke both publicity and discussion

²⁰⁴ Marcia K. Johnson, *Discriminating the Origin of Information*, in *DELUSIONAL BELIEFS: INTERDISCIPLINARY PERSPECTIVES* 34 (Thomas F. Oltmanns & B.A. Maher eds., 1988); Marcia K. Johnson & Carol L. Raye, *Cognitive and Brain Mechanisms of False Memories and Beliefs*, in *MEMORY, BRAIN, AND BELIEF* 35 (D.L. Schacter & Elaine Scarry eds., 2000).

²⁰⁵ Crombag et al., *supra* note 202, at 95.

²⁰⁶ See *id.*

²⁰⁷ See *id.*

and to evoke vivid images are more likely to impair our ability to accurately track the sources of these images.²⁰⁸

Still, "How?" we might ask. How can we confuse *knowledge of facts* we gained from watching television with the actual memory of *seeing an event*? Marcia K. Johnson offered an explanation based on cognitive studies of the contributions of reality monitoring and source monitoring to the delusions and confabulations of the brain damaged or mentally ill.²⁰⁹ She argued that the characteristics making a *perception*, a *belief*, or an *event memory* seem real are common to all three. Because the basis of the sense of reality is the same for a belief as for an actual event memory, the potential for confusion between them is high.

According to Johnson, the bases of the sense of reality include sensory detail, embeddedness in spatial and temporal context, embeddedness in supporting memories, knowledge, beliefs and "*the absence of consciousness of or memory for the cognitive operations producing the event or belief.*"²¹⁰

Notice, all of the factors Johnson cited as sources of the feeling of "*reality*" are often present even when one did *not* witness or experience an event. We can receive a host of information from other sources, such as interviews, conversations with others, or accounts in the media (as in the El Al and TWA cases). The information can provide a great deal of detail, helping us to form our own visual images of the events discussed. It can include more than sufficient contextual and historical information to give us a sense of how the event fits into time, place, and situation and how it makes sense in the context of other relevant knowledge and memories. The high visual imagery for an event that makes sense contextually creates the sense of reality that can become confused with actual reality. Thus, the sense of reality associated with false event memories can be created through any number of pathways, ranging from simply thinking about or imagining something oneself, or describing it to others, to the massive and redundant publicity associated with dramatic public events, of which aviation disasters are powerful examples.

²⁰⁸ Marcia K. Johnson et al., *Phenomenal Characteristics of Memories for Perceived and Imagined Autobiographical Events*, 117 J. EXP. PSYCHOL. GEN. 371 (1988).

²⁰⁹ Johnson, *Discriminating the Origin of Information*, *supra* note 203, at 34; Marcia K. Johnson, *Reality Monitoring: Evidence from Confabulation in Organic Brain Disease Patients*, in AWARENESS OF DEFICIT AFTER BRAIN INJURY: CLINICAL AND THEORETICAL ISSUES 176 (G.P. Prigatano & D.L. Schachter eds., 1991).

²¹⁰ Johnson, *supra* note 203, at 57.

The eyewitness literature has identified a number of factors common to witnesses in a host of events that tend to induce false memories through problems of source monitoring. In the sections that follow, we will first discuss the nature of difficulties in memory caused by dissociation and inaccurate source monitoring. We will then consider specific areas of testimony in which source monitoring causes problems.

Next, we will consider common *causes* of source monitoring errors, such as pretrial publicity or suggestive interviews, and review what is known about interviewing techniques that enhance or minimize memory distortion. We will then turn to the discussion of techniques commonly employed to aid in retrieval of “lost” memories that have been shown to distort memory, and even to create *confabulation*, or false memories. Finally, we will consider organic causes of source amnesia, including brain damage and aging.

1. *The Nature of Dissociation and Source Misattribution*

Accurate recollection depends in part on the ability to recall exactly where, when, and with whom an event occurred *and* from where one’s own exposure to the event came (i.e., being present versus hearing about it later). In other words, accurate recollection includes accurate memory of the *context* in which events or information were encountered. These contextual associations are referred to as “*source memory*.”

Source memory is absolutely crucial to everyday life. It lies at the heart of our ability to distinguish actual memories from intentions, fantasies, delusions and other products of our imagination. Mistakes in these crucial distinctions are not confined to the mentally ill. As asked earlier, how many of us over forty have wondered whether we actually took a pill, mailed a letter, locked the door, etc. or only thought about it?

Our ability to make such everyday distinctions between what we thought about doing and what we actually did depends upon accurate source memory in the same manner as distinctions between reality and fantasy, or between what we actually witnessed during the course of a crime or accident and what we saw and heard described in later media accounts.

Unfortunately, memory research has clearly shown that source memory is extremely fallible. Several lines of research in basic cognitive processing have demonstrated that experiences are often encoded or retained at a level below conscious awareness. In other words, the subject may have no conscious mem-

ory of the experience. Yet, these experiences have demonstrable effects on subsequent behavior, including the feeling of familiarity with the stimulus, with no memory of having been previously exposed to it, and confusion of the source of familiarity among many other effects. These phenomena are documented in literature on what is called "*automatic processing*"²¹¹ and "*implicit memory*."²¹² Together, this research examines the way in which material is registered in memory without conscious awareness, and the way in which the material in memory outside conscious awareness affects current memory and behavior so that the person does not understand the source of the memories or the reasons for current behavior. These processes have been explicitly addressed in the witness memory literature. In fact, errors in source memory are responsible for a number of the common failures of witness memory.

2. *Common Distortions Due to Difficulties in Source Monitoring*

a. Remember When . . . ? Difficulties in Memory For Timing of Autobiographical Events

Among the most common failures of source memory is remembering *when* something happened.²¹³ What if we were asked what we did two weeks ago on Tuesday night? Many of us who have no regularly scheduled activities on Tuesday nights would be at a loss. Or what if we were asked when we last had our oil changed? Even worse, what if we had to recall the year that we read a certain book? Most of us fail miserably when asked such questions.

Memory for times and places is especially poor for events that occur repetitively. Victims of repeated physical or sexual abuse, for example, remember the gist of their experiences. However, they often confuse the details of particular incidents, including the time or dates of particular assaults and which specific actions occurred on which specific occasion. As events recur, it can be-

²¹¹ Bargh, *supra* note 47, at 9.

²¹² Henry L. Roediger & Kathleen B. McDermott, *Implicit Memory in Normal Human Subjects*, in HANDBOOK OF NEUROPSYCHOLOGY 63 (H. Spinnler & F. Boller eds., 1993).

²¹³ Norman R. Brown et al., *The Subjective Dates of Natural Events in Very-Long-Term Memory*, 17 COGN. PSYCHOL. 139 (1985); William J. Friedman, *Memory for the Time of Past Events*, 113 PSYCHOL. BULL. 44 (1993); Elizabeth F. Loftus et al., *Cognitive Psychology Meets the National Survey*, 40 AM. PSYCHOL. 175 (1985).

come difficult to remember exactly when specific actions occurred even though memory for what happened is clear.²¹⁴

Notwithstanding our inability to accurately report times and dates, witnesses are commonly asked to do so. A slate of suspects must report their alibi on the date and time of a crime. To verify one of their alibis, two weeks after the crime the bartender must report whether or not he saw the defendant (a frequent patron) in the bar *on the night of the murder*. Aircraft or automobile owners or mechanics must report when they last performed a particular maintenance activity. Fact witnesses in countless criminal and civil suits report on *when* they had specific conversations or sent a particular piece of mail. In some cases, objective records may be available. However, witness reports of the timing or sequence of events should be regarded with extreme skepticism when there is no external objective verification of their reports. As with any other information where the witness may be uncertain, the potential for distortion due to motivation, self-interest, and other sources of external influence is high.

b. Remember Who . . . ? Misidentification Through Unconscious Transference

The term "*unconscious transference*" refers to a process whereby a witness confuses an innocent but familiar-looking person with the perpetrator. The feeling of familiarity can lead the person into a false identification during police identification procedures (line-ups, show-ups, examination of mug shots, etc.). The witness may incorrectly believe the person is familiar from the crime context rather than from the true context of exposure to him/her.

Technically, the concept of unconscious transference is defined as "*the transfer of one person's identity to that of another person from a different setting, time, or context.*"²¹⁵ It is considered *unconscious* in that the witness misidentifies the familiar innocent person without having a conscious recollection of the previous exposure to him/her and without awareness of the true context

²¹⁴ R. Fivush, *Learning About School: The Development of Kindergartners' School Scripts*, 55 CHILD. DEV. 1697 (1984); R. Fivush et al., *Children's Long-Term Memory for a Novel Event: An Exploratory Study*, 30 MERRILL-PALMER Q. 303 (1984); Katherine Nelson & Janice M. Gruendel, *Generalized Event Representations: Basic Building Blocks of Cognitive Development*, in ADVANCES IN DEVELOPMENTAL PSYCHOLOGY 1 (A. Brown & M. Lamb eds., 1981).

²¹⁵ Read et al., *supra* note 16, at 3.

of the previous exposure. The process of unconscious transference is illustrated in a frequently cited case.²¹⁶

A ticket agent in a railroad station was the victim of an armed robbery and later identified a sailor from a police lineup. The sailor, however, had irrefutable proof that he could not have been at the station at the time of the robbery. When questioned about why he misidentified the sailor, the ticket agent claimed the sailor looked familiar to him. An investigator later discovered that the sailor lived near the train station and had purchased tickets from the agent on three different occasions prior to the robbery. Thus, the ticket agent had clearly seen the sailor before but did not remember him as a customer. Instead, the feeling of familiarity led the ticket agent to assume he recognized the sailor as the robber.

Ironically, one of the more strange and dramatic instances of source confusion on the part of an eyewitness victimized a psychologist whose research had focused on memory distortion and eyewitness identification. Donald Thompson, who had testified frequently as an expert witness on the vagaries of eyewitness memory, himself became the victim of mistaken eyewitness identification. Dr. Thompson was interrogated as a suspect for a rape.²¹⁷ Fortunately, Thompson had an airtight alibi. Ironically, shortly before the rape, he was doing a live television interview describing how people can improve their ability to remember faces. It later came to light that the victim had been watching Thompson on television prior to the rape. Incredibly, the victim appeared to have confused her memory of Thompson from the television show with her memory of the rapist.²¹⁸ Again, memory had committed a virtually unthinkable error.

Such confusions are far from rare. A number of similar cases have been reported, each sharing in common an encounter between the victim and the accused outside the context of the crime. Later, failing to accurately recall the source of their memories of the accused, the victims nevertheless felt a lingering strong sense of familiarity with the accused that misled them into erroneous identification of the accused as the perpetrator.

²¹⁶ M. HOUTS, FROM EVIDENCE TO GUILT (1956); Elizabeth F. Loftus, *Unconscious Transference*, 2 LAW & PSYCHOL. REV. 93 (1976); Read et al., *supra* note 16, at 3; Ross et al., *supra* note 46, at 918.

²¹⁷ See SCHACTER, *supra* note 2, at 114.

²¹⁸ Read et al., *supra* note 16, at 3; Ross et al., *supra* note 46, at 918; Donald M. Thomson, *Context and False Recognition*, in MEMORY IN CONTEXT: CONTEXT IN MEMORY 285 (Graham M. Davies & Donald M. Thomson eds., 1988).

1. *Scientific Evidence of Unconscious Transference*

This process of “*unconscious transference*” has been demonstrated experimentally specifically in the eyewitness context in at least two ways. First, some research has directly examined the potential for innocent but familiar persons to be misidentified as the perpetrator of a crime. Generally, subjects in these studies are exposed to a crime (or other incident). For some subjects the innocent person is present during the crime, but is not the perpetrator. For other subjects, the innocent person is not present at all. At varying later intervals, subjects are asked to inspect a line-up that includes the innocent person. Several such studies have found that the innocent person is more likely to be identified as the perpetrator if (s)he was present at the scene of the crime (incident) than if (s)he was not. Thus, the rate of false identification is increased by the presence of an innocent but familiar person.²¹⁹

2. *Who Said What?*

Generally, studies described as concerning “*unconscious transference*” have addressed confusion of one person’s *behavior* with that of another. However, some studies have addressed the tendency to mistakenly attribute one person’s *statements* to another. This research has shown that confusion of the source of statements tends to occur for people perceived as belonging to the same salient social category. For example, the statements of those forming a minority in social groups are more frequently confused than those in the majority. Justice Ruth Bader Ginsburg, for example, noticed that she tends to be confused with Justice O’Connor by attorneys addressing the Supreme Court.²²⁰ Similarly, source errors for statements are more likely to occur

²¹⁹ Robert Buckhout, *Eyewitness Testimony*, 231 SCI. AM. 23 (1974); Brown et al., *supra* note 17, at 311; Loftus, *supra* note 215, at 93; Douglas Peters, *A Naturalistic Study of Earwitness Memory: Does the Addition of Voice to a Lineup Influence Accuracy and/or Confidence*, in ANNUAL MEETING OF THE EASTERN PSYCHOLOGICAL ASSOCIATION (1985); Read et al., *supra* note 16, at Experiment 5-10; Ross et al., *supra* note 46, at 918; M. Phillips et al., *Some Boundary Conditions for Bystander Misidentification*, 24 CRIM. JUSTICE & BEH. 370-390 (1997); D. Ross et al., *Unconscious Transference and Mistaken Identity: When a Witness Misidentifies a Familiar with an Innocent Person*, 79 J. APPL. PSYCHOL. 918-930 (1994); R. Geiselman et al., *Unconscious Transference and Characteristics of Accurate and Inaccurate Eyewitnesses*, 2 PSYCHOL. CRIME & LAW 197-209 (1996); R. Geiselman et al., *Transference of Perpetrator Roles in Eyewitness Identifications from Photoarrays*, 11 AMER. J. FORENSIC PSYCHOL. 5-15 (1993).

²²⁰ Ruth Bader Ginsburg, *The New Look of Liberalism on the Court*, N.Y. TIMES, Oct. 5, 1997, at § 6 (Magazine) at 60.

between members of the same race than between those of different races. Highly prejudiced people for whom race is a more salient social category show greater tendency to confuse within race sources than those low in prejudice.²²¹

c. Biased Identification Procedures

Unconscious transference has also been shown to create false identifications in police line-ups. For example, studies of identification procedures have shown that innocent persons who were present in mug books are often misidentified during a line-up procedure.²²² This is presumed to occur because the person's face is familiar to the witness from the context of looking at mug shots. The witness then confuses the source of the person's familiarity and concludes that the person is the perpetrator.

John Shepherd²²³ recommended that if one witness identifies a suspect from a mug-shot array, other witnesses should attempt the line-up identification if possible. This would avoid a line-up identification that resulted inappropriately from familiarity with the suspect strictly from exposure to his or her picture in the mug book rather than from the scene of the crime. A number of other problems with eyewitness identification procedures have been identified.²²⁴

d. Effects of Pre-Trial Publicity: Is This Real or Did I See It on TV?

Many cases, particularly those involving multiple victims, highly unusual events, high profile parties, or dramatic, interesting crimes, find their way into the mass media long before they appear in court. Media accounts include many details of the event, the parties involved, speculations regarding the causes, motives, consequences, and so on. They often show pictures of

²²¹ KUNDA, *supra* note 53, at 46.

²²² Brown et al., *supra* note 17, at 311; Cutler et al., *supra* note 26, at 223; Anthony N. Doob & H. M. Kirschenbaum, *Bias in Police Lineups-Partial Remembering*, 1 J. POLICE SCI. & ADMIN. 287 (1973); Gabriel W. Gorenstein & Phoebe C. Ellsworth, *Effect of Choosing an Incorrect Photograph on a Later Identification by an Eyewitness*, 65 J. APPL. PSYCHOL. 616 (1980); JOHN SHEPHERD ET AL., IDENTIFICATION EVIDENCE: A PSYCHOLOGICAL EVALUATION (1982).

²²³ SHEPHERD ET AL., *supra* note 221.

²²⁴ BRIAN L. CUTLER & STEVEN D. PENROD, MISTAKEN IDENTIFICATION: THE EYEWITNESS, PSYCHOLOGY, AND THE LAW (1995); Gary L. Wells, *What Do We Know About Eyewitness Identification*, 48 AM. PSYCHOL. 553 (1993); Gary L. Wells et al., *From the Lab to the Police Station: A Successful Application of Eyewitness Research*, 55 AM. PSYCHOL. 581 (2000); Wells et al., *supra* note 8, at 603.

the scene, the victims, accused perpetrators and much more. Both the TWA 800 crash and the Dutch El Al crash provided excellent real-life demonstrations of the power of the media to shape memories both among witnesses to the original event and among later consumers of media portrayals. Hans Crombag's²²⁵ study of memories of the El Al crash showed that verbal descriptions in media accounts can create elaborate, subjectively real and compelling pseudo-memories of seeing the physical event. The witness accounts of the TWA crash illustrated the power of media accounts to influence *reconstructive memory* processes. "Hindsight" and "retrospective" biases caused witnesses to reconstruct memories of what they saw in the sky to fit the missile theory of the explosion that had permeated press accounts for over a year.²²⁶

Social science research has clearly demonstrated the biasing effects of exposure to pre-trial publicity. Most of this research has focused on potential effects on jurors, primarily with regard to criminal trials. Generally, it has been demonstrated that the more people know about a case, the more likely they are to presume the defendant guilty even when they claim to be impartial,²²⁷ and the more jurors know about a case, the more likely they are to vote for conviction.²²⁸ The biasing impact of such publicity is even more powerful when the news is seen on television rather than in print.²²⁹

Such demonstrations show clearly that beliefs are influenced by information acquired from the media *among those who hear about the event from secondary sources*. The media present far more incriminating information than exculpatory information. Thus, not surprisingly, those who are exposed to it tend to presume guilt.

What about the effects on witnesses who watch and read all of the same reports of the incident as the potential jurors? Again, source confusion plays a crucial role. Witnesses may confuse the face of a suspect presented on television with that of the real

²²⁵ Crombag et al., *supra* note 202, at 95.

²²⁶ Loftus & Castelle, *supra* note 167, at 207.

²²⁷ Gary Moran & Brian L. Cutler, *The Prejudicial Impact of Pretrial Publicity*, 21 J. APPL. SOC. PSYCHOL. 345 (1991).

²²⁸ N.J. KERR et al., *On the Effectiveness of Voir Dire in Criminal Cases with Prejudicial Pretrial Publicity: An Empirical Study*, 40 AM. U. L. REV. 665 (1991).

²²⁹ James R. P. Ogloff & Neil Vidmar, *The Impact of Pretrial Publicity on Jurors: A Study to Compare the Relative Effects of Television and Print Media in a Child Sex Abuse Case*, 18 LAW & HUM. BEHAV. 507 (1994).

perpetrator. They may become more confident of their memory as a result of hearing their own or others' reports presented on television. They may hear reports of events or descriptions of persons they did not directly witness and later "*remember*" these memories as if they were their own. They may hear that a suspect is in custody and therefore assume (s)he is in a line-up they later inspect.

Just as in the case of unconscious transference, the information or person becomes "*familiar*" because the witness did see or hear it somewhere (in this case in media reports). This feeling of familiarity is later confused with actual memory of personally witnessing the event or of personally observing the information or evidence in question. In addition, the media can have direct persuasive effects, giving the witness confidence that the evidence reported is true or that the suspect presented is the actual perpetrator.

The tendency of media accounts to directly persuade and to create source confusion among witnesses can carry a double whammy. When it offers potentially unreliable post-event reports, media coverage may simultaneously present false information to the witness, causing the witness to later remember it as if (s)he had personally witnessed it *and* present information that the witness at first discounts as incredible, but later finds persuasive.

Persuasion research has shown that we are typically sensitive to the expertise, knowledgeability, and trustworthiness of the source of information *when we first hear it*. We are more likely to believe those that are more credible and trustworthy than those who are not.

This crucial ability to distinguish information likely to be true from information likely to be false is compromised, however, by another failure of source monitoring termed *source dissociation*. This term refers to the situation in which a person does remember information (s)he has heard but forgets where it came from. Source dissociation tends to occur with the passage of time so that we later become more persuaded by information coming from a low-credibility source. We tend to forget that the source lacked credibility and consequently forget to discount the information.²³⁰

²³⁰ Anthony R. Pratkanis et al., *In Search of Reliable Persuasion Effects: III. The Sleeper Effect is Dead: Long Live the Sleeper Effect*, 54 J. PERS. & SOC. PSYCHOL. 203 (1988).

Generally, research has shown that we have a bias toward believing in the truth of what we hear, and that it takes more cognitive effort to disbelieve than to believe.²³¹ Thus, particularly when we fail to remember source cues that would cast doubt on the truth of particular information, we will tend to accept it as truth.²³² Thus, source dissociation leads to a general failure in witness ability to accurately report where information has come from *and* in their ability to remain unaffected by unreliable information.

e. The Misinformation Effect

The power of suggestive questions has been illustrated in Elizabeth Loftus's classic studies on (mis)leading questions. In some of her early studies, she showed that (mis)leading questions can cause witnesses to falsely remember seeing a yield rather than a stop sign, a conspicuous barn in a bucolic scene that actually contained no buildings at all, broken glass and tape recorders that were not present, a white instead of a blue vehicle in a crime scene, incorrect colors of objects, curly rather than straight hair, and Minnie Mouse when they actually saw Mickey Mouse.

In other studies, Loftus and her colleagues showed that the language of the questions asked may shape reports of events. For example, when asked how fast a car was going when it "*hit*" versus when it "*smashed into*" another car, subjects gave higher estimates of speed when the wording "*smashed into*" was used. Later, they were also more likely to report having seen broken glass (since this occurs more often with higher speed collisions). Thus, these studies showed that (mis)leading questions can lead people both to *add* things to their memories and to *alter* memories of those things they did see.²³³

Misleading questions tend to induce the greatest distortion when introduced after a delay rather than immediately after the

²³¹ Daniel T. Gilbert, *How Mental Systems Believe*, 46 AM. PSYCHOL. 107 (1991).

²³² Begg et al., *supra* note 188, at 446; Gilbert, *supra* note 230, at 107.

²³³ Elizabeth F. Loftus & Edith Greene, *Warning: Even Memory for Faces May Be Contagious*, 4 LAW & HUM. BEHAV. 323 (1980); Elizabeth F. Loftus & John C. Palmer, *Reconstruction of Automobile Destruction: An Example of the Interaction Between Language and Memory*, 13 J. VERB. LEARN. & VERB. BEHAV. 585, 586-588 (1974); Elizabeth F. Loftus, *Leading Questions and the Eyewitness Report*, 7 COGN. PSYCHOL. 560 (1975); Elizabeth F. Loftus, *Shifting Human Color Memory*, 5 MEM. & COGN. 696 (1977); LOFTUS, *supra* note 182.

event,²³⁴ when the wording of the misleading question is more definite (e.g., "Did you see *the* stop sign?" versus "Did you see *a* stop sign?"),²³⁵ when encountering or retrieving suggested information under conditions of limited attentional resources,²³⁶ and when the source of the misleading information is of high status or apparently unbiased.²³⁷

Misleading information also creates more distortion among children than adults,²³⁸ for peripheral rather than central detail,²³⁹ for more poorly remembered information,²⁴⁰ and when it is subtle rather than blatant.²⁴¹ On the other hand, less distortion is observed for negative information with high personal significance.²⁴²

Nevertheless, in the years since Loftus's original demonstrations of the misinformation effect, research has shown how (mis)leading questions can cause a person to develop false memories of much more dramatic incidents, including incidents involving the self as well as others. For example, this process has been illustrated by studies on child witnesses. In these studies, children are first subjected to an event about which they are later questioned in a leading and repetitive fashion (including repeated leading and suggestive questioning about an aspect of the event that *did not happen*). Many of the children will later report that the suggested events did occur. Thus, although it may be debated whether *actual memory* or simply the *report* of the

²³⁴ Elizabeth F. Loftus, *Reactions to Blatantly Contradictory Information*, 7 MEM. & COGN. 368, 372-373 (1979).

²³⁵ Elizabeth F. Loftus & Guido Zanni, *Eyewitness Testimony: The Influence of the Wording of a Question*, 5 BULL. PSYCHON. SOC'Y 86 (1975).

²³⁶ Maria S. Zaragoza & Sean M. Lane, *Processing Resources and Eyewitness Suggestibility*, 3 LEGAL & CRIMINOLOGICAL PSYCHOL. 305 (1998).

²³⁷ Norman J. Bregman & Hunter A. McAllister, *Eyewitness Testimony: The Role of Commitment in Increasing Reliability*, 45 SOC. PSYCHOL. Q. 181 (1982); Stephen J. Ceci et al., *Suggestibility of Children's Memory: Psycholegal Implications*, 116 J. EXP. PSYCHOL. 38 (1987); David H. Dodd & Jeffrey M. Bradshaw, *Leading Questions and Memory: Pragmatic Constraints*, 19 J. VERB. LEARN. & VERB. BEHAV. 695, 701 (1980); Elizabeth F. Loftus, *Impact of Expert Psychological Testimony on the Unreliability of Eyewitness Identification*, 65 J. APPL. PSYCHOL. 9 (1980).

²³⁸ Ceci et al., *supra* note 236, at 38.

²³⁹ LOFTUS, *supra* note 182, at 42.

²⁴⁰ Kent H. Marquis et al., *Testimony Validity as a Function of Question Form, Atmosphere, and Item Difficulty*, 2 J. APPL. SOC. PSYCHOL. 167 (1972); J. Don Read & Darryl Bruce, *On the External Validity of Questioning Effects in Eyewitness Testimony*, 33 INT'L REV. APPL. PSYCHOL. 33 (1984).

²⁴¹ LOFTUS, *supra* note 182, at 57; Ornstein et al., *supra* note 87, at 49.

²⁴² Maggie Bruck et al., *Reliability and Credibility of Young Children's Reports: From Research to Policy and Practice*, 53 AM. PSYCHOL. 136 (1998).

event is altered, clearly the process of questioning alters the witness' testimony.

In one experiment, for example, Stephen J. Ceci and his colleagues²⁴³ asked preschool children about some everyday events that had actually occurred and others that had never happened (as verified by the children's parents). In one of these, the "mousetrap" incident, they asked children to recall when they "got a finger caught in a mousetrap and had to go to the hospital to get the trap off." For the next ten weeks, the interviewer repeatedly asked children to think hard about the incidents and try to visualize them.

At the end of the ten weeks, children were asked, "Tell me if this ever happened to you: Did you ever get your finger caught in a mousetrap and have to go to the hospital to get the trap off?" Over half of the children "remembered" at least one of the made-up incidents. More astonishing was the richness and fabricated detail of the false memories. The children included long descriptions of what led up to the finger getting caught, detailed descriptions of the hospital personnel and procedures, how they got there, and incidents that happened on the way, among others.

Clearly, misleading questioning can lead to autobiographical confabulations in children.²⁴⁴ They can also result in false reports of recent everyday events. Leichtman and Ceci found that a visitor to their school could mislead children into false reports of a number of behaviors. A number of other studies have found similar results.²⁴⁵

Although some may question the extent to which children may be misled, both the real-life cases of fantastic confabulations in preschoolers and the hundreds of studies of the suggestibility of children's memories have shown beyond doubt that children *can be* misled into false reports of events both mundane and bizarre. Such false memories are likely the result, in part, of impaired source memory.²⁴⁶

In fact, studies of source monitoring in children have shown that compared to older children and adults, younger children

²⁴³ STEPHEN J. CECI & MAGGIE BRUCK, *JEOPARDY IN THE COURTROOM* (1995).

²⁴⁴ Maggie Bruck & Stephen J. Ceci, *Amicus Brief for the Case of State of New Jersey v. Michaels Presented by Committee of Concerned Social Scientists*, 1 PSYCHOL. PUB. POL. L. 246, 272 (1995); Stephen J. Ceci & Maggie Bruck, *Suggestibility of the Child Witness: A Historical Review and Synthesis*, 113 PSYCHOL. BULL. 403 (1993); CECI & BRUCK, *supra* note 242.

²⁴⁵ Ceci & Bruck, *supra* note 243, at 403; CECI & BRUCK, *supra* note 242.

²⁴⁶ SCHACTER, *supra* note 2, at 118.

are less able to accurately identify the source of suggested information,²⁴⁷ are more likely to confuse actions they did perform with those they only imagined performing,²⁴⁸ and make more errors in source monitoring when confronted with similar rather than dissimilar sources.²⁴⁹ Although both children and adults are more susceptible to source confusion with similar than dissimilar sources, children are more susceptible.

Nevertheless, adults are not immune to source monitoring difficulties, and may also be led to falsely report autobiographical memories. Loftus²⁵⁰ succeeded in implanting a memory of being lost in a shopping mall as a child among college students. In this study, the "misinformation" came from the researchers, who gave subjects a description of an incident in which they were supposedly lost in a mall for an extended period, became upset and cried, and were comforted by an elderly woman. The descriptions supposedly came from the subjects' parents. The parents, however, had verified that the incident had never occurred.

Subjects were asked to write as much as they could recall about the incident that never was. Later, in follow-up interviews, subjects were asked to report as much detail about the incident as they could remember. Fully 25% of their subjects falsely "remembered" having been lost in the mall, and many provided very detailed descriptions of the event, including much detail not included in the original suggested event. Similar results were obtained for other implanted childhood events.²⁵¹

Some evidence suggests that the ability to "implant" memories may depend on the plausibility of the events suggested.²⁵² Similarly, Kathy Pezdek and C. Roe²⁵³ found that it is easier to

²⁴⁷ Jennifer K. Ackil & Maria S. Zaragoza, *Developmental Differences in Eyewitness Suggestibility and Memory for Source*, 60 J. EXP. CHILD PSYCHOL. 57 (1995).

²⁴⁸ Janat Fraser Parker, *Age Differences in Source Monitoring of Performed and Imagined Actions on Immediate and Delayed Tests*, 60 J. EXP. CHILD PSYCHOL. 84 (1995).

²⁴⁹ D. Stephen Lindsay et al., *Developmental Changes in Memory Source Monitoring*, 52 J. EXP. CHILD PSYCHOL. 297 (1991).

²⁵⁰ Elizabeth F. Loftus & Jacqueline E. Pickrell, *The Formation of False Memories*, 25 PSYCHIATRY ANNALS 720 (1995).

²⁵¹ *Id.* at 720; Ira E. Hyman et al., *False Memories of Childhood Experiences*, 9 APPL. COGN. PSYCHOL. 181 (1995).

²⁵² Kathy Pezdek et al., *Planting False Childhood Memories: The Role of Event Plausibility*, 8 PSYCHOL. SCI. 437 (1997).

²⁵³ Kathy Pezdek & C. Roe, *The Suggestibility of Children's Memory for Being Touched: Planting, Erasing, and Changing Memories*, 21 LAW & HUM. BEHAV. 95 (1997).

change or distort memory for something that did occur than to implant memories for something that did not occur.

Further, it is possible to introduce "*resistance*" to the effects of misleading interviews. Witnesses who are warned, for example, of the potential for incorrect information are less affected by it,²⁵⁴ with more explicit warnings being more effective.²⁵⁵

f. Coercive Interrogations/Interviews

Perhaps the most startling demonstrations of the power of suggestive questions to elicit false memories are those of the ability of coercive interrogation to elicit false confessions. These demonstrations have shown that people can be led to falsely remember or least report their own past behavior, even to the extent of falsely remembering murder, sex abuse, or other heinous crimes.

Police interrogation techniques include two general approaches designed to encourage confession. The first is to befriend the suspect, offer sympathy and friendly advice, and "*minimize*" the offense by offering face-saving excuses, including blaming the victim. The second is designed to intimidate the suspect by exaggerating the charges or pretending to have damaging evidence such as fingerprints or an eyewitness, leading the suspect to feel it is useless to deny the crime.²⁵⁶

Such tactics can be useful in eliciting true confessions. Unfortunately, however, they are known to elicit false confessions as well. Some, of course, are knowingly false, perhaps the result of exhaustion and desperation to escape further pressure or abuse from the police. Others, however, occur because the witness becomes genuinely convinced (s)he committed the crime.

The first step toward false memory is often false *belief*. A person who does not remember committing a crime or believe (s)he committed the crime may nevertheless become convinced

²⁵⁴ Robert E. Christiaansen & Kathleen Ochalek, *Editing Misleading Information from Memory: Evidence for the Coexistence of Original and Postevent Information*, 11 MEM. & COGN. 467 (1983); Read & Bruce, *supra* note 239, at 33; Edith Greene et al., *Inducing Resistance to Misleading Information*, 21 J. VERB. LEARN. & VERB. BEHAV. 207 (1982).

²⁵⁵ Lynn Hasher et al., *I Knew It All Along: Or Did I?*, 20 J. VERB. LEARN. & VERB. BEHAV. 86 (1981).

²⁵⁶ GISLI H. GUDJONSSON, *THE PSYCHOLOGY OF INTERROGATIONS, CONFESSIONS, AND TESTIMONY* (1992); F.E. INBAU ET AL., *CRIMINAL INTERROGATION AND CONFESSIONS* (3d ed. 1986); Saul M. Kassin, *The Psychology of Confession Evidence*, 52 AM. PSYCHOL. 221 (1997).

of his or her own guilt through the constant pressure and false claims of proof provided by police. Faced with seemingly convincing evidence of guilt, the person first begins to *believe* (s)he committed the crime, then begins to picture doing the crime, and finally, the person "*remembers*" having done it.

1. *The Inextricable Relationship Between Memory and Belief*

*"Memories are beliefs about what happened, and beliefs are constructed from, and reinforced by, memories."*²⁵⁷

Among the many stories of false confessions, perhaps the most astonishing is the story of Paul Ingram, a man accused by his two daughters of rape and a host of satanic ritual cult atrocities, including ritual sexual abuse and murders of infants. Faced with more than five months of incessant interrogation by detectives, a psychologist and a minister, Paul Ingram (chief civil deputy of the sheriff's department, chair of the local Republican party, conservative Christian churchgoing pillar of his community) confessed to sexually abusing his two daughters over a period of seventeen years. He acknowledged his role as high priest of a satanic cult involved in ritual sodomy, murder, dismemberment, and cannibalization of infants.²⁵⁸ How could Ingram confess and *believe* that he committed such outrageous acts if they never occurred? A close analysis of the case revealed the crucial role of *belief* throughout.

The case began when one of Ingram's daughters attended a revival where another participant, Karla Franko, held the participants in thrall with reports of her many "*visions*." The meeting was highly emotional and had produced a number of "*visions*" related to abuse, as well as sudden revelations among other participants. Subsequently, while praying over Ingram's daughter, Franko announced that she knew the "*truth*" and that Ericka, Ingram's daughter, had been abused as a child. Further, she identified the abuser as Ericka's father and said the abuse had taken place over many years. She advised Ericka to seek counseling in order to uncover the traumatic memories.

Belief first impacted this case with Ericka's assumption, based on her religious beliefs, that Franko's vision would be true. Shortly after, both Erica and her sister Julie accused their father and their two brothers of rape and long-term abuse.

²⁵⁷ Johnson & Raye, *supra* note 203, at 36.

²⁵⁸ LOFTUS & KETCHAM, *supra* note 94; LAWRENCE WRIGHT, REMEMBERING SATAN (1994).

Over the next five months, Ingram was subject to repeated interrogations. At the same time, the stories his daughters told escalated from rape and abuse to ritual Satanic abuse, infant abuse, murder, and sex with dogs, goats, and witches. Furthermore, the list of accused expanded from their father to their mother, as well as to other members of the community.

At first, Ingram denied any memory of sex with his daughters or of any ritual abuse. Nevertheless, while still possessing no memory of any of the crimes of which he was accused, after the first four hours of interrogation, Paul Ingram confessed to abusing his daughters. During those four hours, the police had *convinced* Ingram that he committed the crime. How could they have convinced Paul Ingram that he was guilty of behaviors of which he never before imagined himself capable?

The answer lies in the power of preexisting beliefs. First, Paul Ingram believed in his daughters. He believed they were decent, honest girls who would not lie about something as serious as abuse. The police reinforced this belief by constantly asking him why his daughters would say such things if they were not true and exhorting him to help his daughters by telling the truth. In addition, the police were his friends and colleagues whom he trusted. He believed they would not try to deceive him.

Secondly, Paul Ingram believed in repression. He believed that violent criminals and sex offenders often repress memories of their crimes, unable to face the horror of what they have done. He personally witnessed such denial and apparent repression as a member of the sheriff's office. In addition, Ingram believed in Satan and in the power of Satan both to cause evil behavior and to destroy the memory of it (a belief suggested and reinforced by his family minister).

Finally, Ingram believed in the restorative power of confession. He believed the only way to find the truth was to admit his guilt. If he confessed, he believed, his memory would return. These three beliefs made Ingram willing to believe he had done what his daughters claimed he had done. All that remained was to remember.

The first step, he believed, was to confess. So, he confessed. But he described his behavior in terms of inference. Instead of saying, "*I went into her bedroom,*" he would describe what he did with the preface, "*I would have.*" He had no real memory—only belief in his guilt.

The next morning, Ingram was visited by psychologist Richard Peterson, whom Ingram asked why he was unable to remember the events of which he was accused. Peterson told Ingram it is not unusual for sex offenders to repress memories of their crimes. Peterson even went so far as to suggest that Ingram had been the victim of sexual abuse as a child and that Ingram had learned to repress as a child when he had to repress his memories of his own abuse. Finally, Peterson, as the detectives and Ingram's minister had done, assured him that once he confessed to the crimes his memories would come back.

Throughout the investigation preceding his trial, Ingram remained convinced that he must be guilty and focused on trying to remember what he had done. Meanwhile, his daughters continued to change and add to their stories. Day after day, the sheriff or others would tell Ingram of his daughters' accusations, and he would try to remember. He practiced a nightly ritual in an effort to remember, putting himself into a trance-like state where he emptied his mind of all else and tried to visualize and remember the events in which he had been told he participated. By the next day, he would provide detailed "*memories*" to the investigators.

Meanwhile, a similar confluence of belief, persuasion and coercive interrogation convinced Ingram's son to first believe and then "*remember*" that he had been raped by his father's friends and colleagues, a story he retracted within the next month. Ingram's wife was induced to confess to involvement in the abuse and to sex with the same friends and poker partners alleged to have raped Ingram's son. These colleagues, in turn, spent over a year in jail, having confessed, like Ingram, that they must have committed (and repressed) the alleged crimes if all those people said they did.

Amid the wild escalation of accusations and confession, noted sociologist Richard Ofshe was called in to consult. Unconvinced by Ingram's confessions, Dr. Ofshe²⁵⁹ resolved to test their source. Having reviewed the records to date, Dr. Ofshe made up an event that had not previously been discussed (an occasion when Ingram presumably made his children have sex with one another while he watched) and told Ingram his children had reported it. As usual, Ingram at first failed to remember it. However, also as usual, Ingram began to "*remember*" after thinking about it and trying to remember, and eventually he pro-

²⁵⁹ OFSHE & WATTERS, *supra* note 94.

duced a three-page confession, including dialogue and great detail.²⁶⁰ This time, however, there was no doubt whatsoever that the confession was false. Even his children testified that this event never happened.

Clearly, Paul Ingram was the victim of powerful forces leading to the creation of false memories. They are the same forces, some in exaggerated form, that occur in the more common suggestive interviews of police and other investigators and counselors with fact witnesses that first give the witness an idea or belief that something may be true which later becomes a "memory." Repeated suggestion, building on a foundation of readiness to believe created by already existing beliefs, motivation to find the truth, lingering doubt about what really happened, and desire to know, subtly or blatantly creates the belief from which the "memories" are finally born. Paul Ingram came to "remember" something much more strange and extreme than most, although the process that led him to it was commonplace.

Even Ingram, however, eventually understood that his "memories" were false. Once he pleaded guilty to hundreds of incidents of abuse, satanic abuse, rape, and much more, he was finally left alone with his thoughts. Soon he began to doubt the reality of his confessed deeds, and eventually recanted, too late, in court.

Paul Ingram's confessions of sexual abuse are the latest modern manifestation of the age-old relationship between core beliefs and false confessions or memories. Several hundred years ago, belief in God and the devil inspired tens of thousands to confess to witchcraft and to implicate friends, family and even animals in Satan's circle. More recently, scores of people report abductions by aliens or recovered memories of past lives. Clearly, firm belief in the *possibility* of such events precedes false beliefs in and later false memory of their *actuality*.

2. *False Confessions in the Laboratory*

Saul M. Kassin and Katherine L. Kiechel²⁶¹ proposed that two factors increase the risk of false confession among those confronted with coercive interrogations: (1) a suspect with unclear memory of the event in question; and (2) presentation of false evidence against him/her. The authors tested this proposition

²⁶⁰ LOFTUS & KETCHAM, *supra* note 94, at 257.

²⁶¹ Saul M. Kassin & Katherine L. Kiechel, *The Social Psychology of False Confessions: Compliance, Internalization, and Confabulation*, 7 PSYCHOL. SCI. 125 (1996).

in the laboratory by causing a computer to crash while undergraduate subjects were using it. Half were working on a fast-paced task and the other half on a slow-paced task, thereby making it more or less difficult for the subject to remember what actually happened immediately before the crash. The subjects were falsely accused of having caused the crash by hitting a key they had been specifically warned to avoid. All students at first denied the charge. However, half were confronted by a second student who had been present at the time of the crash (actually a confederate of the experimenter) who claimed to have seen the student hit the forbidden key.

As the authors expected, students were most likely to deny publicly and to later admit guilt privately when their own memories were less clear (i.e., those who were performing the fast-based task), and when they were confronted with "*evidence*" that the other student saw them cause the crash.

g. Lost and Found: Biasing Aids to Memory Retrieval

Techniques commonly used as aids to memory retrieval are known to produce distortion and confabulation, but also some enhancements in true memory. Such techniques include hypnosis, relaxation and guided imagery, memory recovery groups, memory recovery "*homework*," and other common therapeutic techniques. The potential for memory distortion and outright fabrication through these techniques is well documented in the literature on "*recovery*" of memories of child sex abuse.²⁶²

To the extent that an alleged victim or other witnesses report use of such techniques, the memories recovered through their use must be regarded with caution. It is well worthwhile to ask witnesses about the source of their memories, and whether they used any special techniques to try to help them remember what happened.

1. *Efforts to Remember*

When a witness experiences difficulty remembering some or all of an event, (s)he is typically encouraged to *try* to remember. Recommendations for how to try to remember vary from the simple instruction to "*try*" to a variety of memory recovery techniques as discussed below. All of these techniques share in the common instruction to think about the event. Some instruct

²⁶² Loftus, *supra* note 94; LOFTUS & KETCHAM, *supra* note 94; OFSHE & WATTERS, *supra* note 94.

the subject to write down their thoughts and feelings about the event (whether or not they currently remember anything about it). Others instruct the subject to *imagine* or *visualize* the event or to concentrate on certain aspects to try to remember them better.

Although these kinds of efforts may appear to be legitimate paths to recovery of lost memories, all have been shown to increase the probability of distortion, as discussed below.

2. *Direct and Indirect Suggestion*

Efforts to recover memories are typically subject to both direct and indirect suggestions regarding what might have happened from police, investigators, therapists, other witnesses, friends and family, and others. The previously cited literature on the "*misinformation effect*" has clearly shown that suggestions can alter or fabricate memories. However, when the suggestions come in the context of memory retrieval processes (such as hypnosis, etc.), they have even greater potential to distort memory.

3. *Hypnosis*

Hypnosis is widely believed to be an effective aid to memory recovery among police, mental health professionals, and the general public. Over 90% of the public, for example, endorses such beliefs as: "*A person can remember more while hypnotized;*" "*Memory works like a video camera;*" or "*Hypnosis improves memory.*" Roughly three quarters or more believe that one cannot lie while hypnotized. In other words, hypnosis is widely believed not only to increase the *amount* one can remember, but also to improve the *accuracy* of one's memories.

Unfortunately, nothing could be farther from the truth. Although people do tend to remember *more* while hypnotized, the additional information is just as likely to be false as it is to be true. Further, to make matters worse, hypnosis also tends to increase the subject's *confidence* in the accuracy of the new memories. Thus, the ratio of correct to incorrect information may actually decline even as subjects' conviction of the truth of their memories increases.²⁶³

²⁶³ Kevin M. McConkey, *The Effects of Hypnotic Procedures on Remembering*, in CONTEMPORARY HYPNOSIS RESEARCH 405 (E. Fromm & M.R. Nash eds., 1992); ALAN W. SCHEFLIN & JERROLD LEE SHAPIRO, THE GUILFORD CLINICAL & EXPERIMENTAL HYPNOSIS SERIES (1989); Spiegel, *supra* note 84.

By its nature, hypnosis is a state of aroused, attentive, focused concentration, including heightened imagination, and heightened sensitivity and responsiveness to social cues (including suggestion). Thus, by its nature, it enhances the subject's susceptibility to influence and suggestibility.

These external forces are enhanced by the nature of the persons who tend to be hypnotizable. Three essential ingredients characterize the hypnotic experience: (1) *absorption*, or the immersion in a focal experience at the expense of other aspects of the context; (2) *dissociation*, or the tendency to restrict conscious processing of perceptions, thoughts, memories, motor activities, or sensory experiences that are not the focus of attention (such as not feeling pain); and (3) *suggestibility*, or the uncritical acceptance of instructions or suggestions. Each of these ingredients is more characteristic of hypnotizable than of non-hypnotizable individuals, even when they are not under hypnosis. Thus, hypnotizable individuals are already more suggestible before they are hypnotized, and this suggestibility is further enhanced while they are hypnotized.²⁶⁴

Finally, the potential for hypnosis to generate distortions in memory is enhanced by the concurrent use of other memory retrieval techniques known to create distortion on their own. These include repeated questioning, direct and indirect suggestion, age regression, and guided imagery (as discussed below). Hypnosis for the purpose of memory retrieval is, more often than not, accompanied by one or more of these additional techniques, thus magnifying the potential for each of them to create distortion.

4. *Guided Imagery/Imagination*

"*Guided imagery*" and imagination-based techniques are common to several different techniques of memory retrieval, including hypnosis, relaxation techniques, home memory exercises involving visualization, and attempts to recover memory by imagining the events sought in memory. The subject is asked to imagine the situation (s)he is trying to remember and then picture (visualize) the event. Unfortunately, both visualization and deliberate imagination have been shown to create or alter memory.

²⁶⁴ McConkey, *supra* note 262, at 405; SCHEFLIN & SHAPIRO, *supra* note 262; Spiegel, *supra* note 84.

a. Memory and Visualization: From Seeing in the Mind to Remembering as Fact

Marcia K. Johnson's²⁶⁵ source-monitoring theory suggests that the feeling of reality for memories is directly associated with sensory detail. Thus, when a person retrieves event-related information, it will more likely seem like an actual "memory" of the event itself if it includes a lot of sensory detail, such as visual imagery of the details of the event. For example, people often argue for the validity of memories of autobiographical events based on their "memory" of visual detail²⁶⁶ further reported confidence in the reality of memories is associated with the level of detail.²⁶⁷ Simply *thinking* about events, whether real or imagined, maintains the vividness of memories.²⁶⁸

Unfortunately, sensory detail may come from external sources or one's own imagination and self-created visual imagery rather than from the actual event. For example, visual imagery during reading leads people to later say they "remember" seeing in a picture what they actually only read about in the text.²⁶⁹ Similarly, hearing the sound associated with an object (such as the barking of a dog) leads people to later "remember" seeing a picture of a dog.²⁷⁰

²⁶⁵ Johnson, *supra* note 203, at 34.

²⁶⁶ William F. Brewer, *Memory for Randomly Sampled Autobiographical Events*, in 2 EMORY SYMPOSIA IN COGNITION, REMEMBERING RECONSIDERED: ECOLOGICAL AND TRADITIONAL APPROACHES TO THE STUDY OF MEMORY 21 (Eugene Winograd & Ulric Neisser eds., 1988); Johnson et al., *supra* note 207, at 371.

²⁶⁷ Shahin Hashtroudi et al., *Aging and Qualitative Characteristics of Memories for Perceived and Imagined Complex Events*, 5 PSYCHOL. AGING 119 (1990).

²⁶⁸ Aurora G. Suengas & Marcia K. Johnson, *Qualitative Effects of Rehearsal on Memories for Perceived and Imagined Complex Events*, 117 J. EXP. PSYCHOL. GEN. 377 (1988).

²⁶⁹ Robert F. Belli et al., *Memory Impairment and Source Misattribution in Postevent Misinformation Experiments with Short Retention Intervals*, 22 MEM. & COGN. 40 (1994); Helene Intraub & James E. Hoffman, *Reading and Visual Memory: Remembering Scenes That Were Never Seen*, 105 AM. J. PSYCHOL. 101 (1992); Maria S. Zaragoza et al., *Confusing Real and Suggested Memories: Source Monitoring and Eyewitness Suggestibility*, in MEMORY FOR EVERYDAY AND EMOTIONAL EVENTS 401 (N.L. Stein et al. eds., 1997).

²⁷⁰ Linda A. Henkel et al., *Cross-Modal Source Monitoring Confusions Between Perceived and Imagined Events*, 26 J. EXP. PSYCHOL. LEARN. MEM. COGN. 321 (2000).

b. "Imagination Inflation"

*"Ten thousand different things that come from your memory
or imagination—and you do not know which is which,
which was true, which is false."*

Amy Tan, 1991

Elizabeth Loftus coined the term "*imagination inflation*" to refer to the process of creating or strengthening memories through imagination.²⁷¹ Subjects in her "*imagination inflation*" research began by reporting whether a number of life events had or had not happened to them as children. Two weeks later, they were asked to imagine several of the same events. For example, subjects who reported initially that they had never broken a window with their hand were asked to imagine a scene where this happened (including how they tripped and fell, who else was there, and how they felt when it happened). Later, in the final stage of the experiment, subjects again reported on whether they ever experienced any of the original long list of events. For each of the imagined events, imagination inflated confidence that the event had actually occurred in childhood.²⁷²

An experiment by Johnson, Foley, Suengas and Raye²⁷³ may help to explain why false memories of childhood can be created by imagination. They asked subjects to either think of an actual memory from childhood or to imagine the events and then to rate these remembered and imagined events on thirty-nine different characteristics. They also performed the same procedure for recent events. Results indicated that there were almost no differences between the rated characteristics of real and imagined memories for childhood events, although the memories for real and imagined recent events differed in a number of respects.

The authors reasoned that when real memories are vague and lacking in vivid detail, as when they are from the distant past or were never encoded richly in the first place, it will be easier to confuse imagined and real events. If genuine memories cannot be distinguished from false memories on the basis of vividness, richness of perceptual detail, and other contextual information,

²⁷¹ Maryanne Garry et al., *Imagination Inflation: Imagining a Childhood Event Inflates Confidence That It Occurred*, 3 PSYCHON. BULL. REV. 208 (1996).

²⁷² Hyman et al., *supra* note 250, at 181.

²⁷³ Johnson et al., *supra* note 207, at 371.

both will seem equally real and easier to confuse, just as Amy Tan observed.

Thus, the “*imagination inflation*” phenomenon suggests that witnesses who are testifying about events that are not recent, that were never encoded deeply, or were without rich imaging and contextual embedding will be particularly susceptible to memory distortion or creation through the use of imagination based techniques.

Although Loftus’ work has primarily addressed the issue of autobiographical memory in an effort to understand the mechanisms underlying creation of false memories of sexual abuse, other work has examined the ability of imagination to create more mundane event predictions or memories. Imagining a *future* event, for example, has been shown to increase the subjective confidence that the event will actually occur.²⁷⁴ Those future events that are more easily imagined produce greater inflation in confidence.²⁷⁵

Similarly, imagination can influence memory of a variety of events. For example, in a 1988 study, Johnson, Foley and Leach showed that if people imagine another person’s voice as opposed to their own, they are subsequently more likely to claim the other person actually said those words. Further, Johnson, Raye, Wang and Taylor²⁷⁶ showed that the more *often* something is imagined, the more likely people will later “*remember*” it as real, and those who are better at imagining are more likely to develop false memories than those who are poor. Other research has shown that subjects will misremember having performed actions they had only imagined themselves performing.²⁷⁷ Clearly then, imagination can become confused with reality.

²⁷⁴ John S. Carroll, *The Effect of Imagining an Event on Expectations for the Event: An Interpretation in Terms of the Availability Heuristic*, 14 J. EXP. SOC. PSYCHOL. 88 (1978); W. Larry Gregory et al., *Self-Relevant Scenarios as Mediators of Likelihood Estimates and Compliance: Does Imagining Make It So?*, 43 J. PERS. & SOC. PSYCHOL. 9 (1982).

²⁷⁵ Steven J. Sherman et al., *Imagining Can Heighten or Lower the Perceived Likelihood of Contracting a Disease: The Mediating Effect of Ease of Imagery*, 11 PERS. & SOC. PSYCHOL. BULL. 118 (1985).

²⁷⁶ Marcia K. Johnson et al., *Fact and Fantasy: The Roles of Accuracy and Variability in Confusing Imaginations with Real Experiences*, 5 J. EXP. PSYCHOL. HUM. LEARN. & MEM. 229 (1979).

²⁷⁷ Rita E. Anderson, *Did I Do It or Did I Only Imagine Doing It?*, 113 J. EXP. PSYCHOL. GEN. 594 (1984); Mary A. Foley & Marcia K. Johnson, *Confusions Between Memories for Performed and Imagined Actions*, 56 CHILD. DEV. 1145 (1985); Lyn M. Goff & Henry L. Roediger III, *Imagination Inflation for Action Events: Repeated Imag-*

This tendency can be quite dangerous in legal contexts. Memory-recovery techniques emphasizing imagination (hypnosis or guided imagery, for example) can lead to the creation of false memories in which the subject has great confidence, as illustrated in many cases of recovered memories.²⁷⁸ Unfortunately, such techniques are often recommended. For example, Maltz²⁷⁹ encourages clients to “[s]pend time imagining that you were sexually abused, without worrying about accuracy, proving anything, or having your ideas make sense. As you give rein to your imagination, let your intuitions guide your thoughts.” With rampant use of such techniques, the flood of accusations of sex abuse based on “recovered” memories should be no surprise.

Although false memories are often created in the context of therapeutic use of these techniques, law enforcement personnel sometimes attempt to induce suspects to engage in repeated acts of imagination of the criminal act as a means of inducing the suspect to confess.²⁸⁰ In part, such imagination exercises were responsible for Paul Ingram’s confessions.

c. Age Regression

Nicholas Spanos and his colleagues²⁸¹ have developed a procedure for demonstrating how not only *false*, but also *impossible* memories may be created by the common therapeutic technique of “age regression.” Subjects were misled to believe they had been born in a hospital with swinging, colored mobiles over the crib. Half were then hypnotized, age-regressed to the day after birth and asked what they remembered. The other half were led through a mnemonic procedure using age regression. They were encouraged to imagine the infant experiences and try to recreate them. The majority of subjects in each group reported “memories” of the hospital, hospital personnel and/or mobiles (95% of the imagination group and 70% of the hypnotized group).

ings Lead to Illusory Recollections, 26 MEM. & COGN. 20 (1998); Lindsay et al., *supra* note 248, at 297.

²⁷⁸ LOFTUS & KETCHAM, *supra* note 94; OFSHE & WATTERS, *supra* note 94; Loftus, *supra* note 94.

²⁷⁹ WENDY MALTZ, *THE SEXUAL ABUSE HEALING JOURNEY* 50 (1991).

²⁸⁰ Richard J. Ofshe, *Inadvertent Hypnosis During Interrogation: False Confession Due to Dissociative State: Mis-Identified Multiple Personality and the Satanic Cult Hypothesis*, 40 INT’L J. CLIN. EXP. HYPN. 125 (1992).

²⁸¹ Nicholas P. Spanos et al., *Creating False Memories of Infancy with Hypnotic and Non-Hypnotic Procedures*, 13 APPL. COGN. PSYCHOL. 201 (1999).

5. *Dream Interpretation*

a. Do Dreams Replay Actual Events?

Some time after his initial descriptions of the event, helicopter pilot Meyer (the witness to the TWA 800 explosion) reported to investigators that he finally “saw” what happened clearly in a dream. At that point, his description included a previously unreported detail. He added the “memory” of having seen an impact and explosion preceding the explosion of the plane itself. His dream had shown him a vision of the event much more consistent with the missile theory that had become widely publicized after his initial reports. Like many people, he believed that dreams could be exact reenactments of events we have participated in or witnessed. Armed with that belief, he confidently reported his dream version of the explosion as if it was a video recording of the actual event itself.

Sigmund Freud popularized the notion that dreams are symbolic representations of emotions, experiences and motives outside conscious awareness (the “royal road” to the unconscious). Thus, with proper interpretation, Freud argued, dreams provide the key to the unconscious mind, including “repressed” memories of actual events.²⁸²

Modern dream research, however, has shown that the content of dreams is less symbolic than Freud believed. Dreams tend to reflect what is happening in daily life.²⁸³ If a person is thinking about something during the day, there is a good chance the person may dream of it at night. However, the dream is simply the residue of the day’s concerns and not an authentic memory of actual events. As the source-monitoring framework suggests, because dreams are high in visual imagery and often in emotion and other perceptual details, they can seem very real. This sense of reality increases the chance of confusion with a real memory.

b. Creation of False Memories Through Dream Interpretation

Clearly, dreams do not replay events exactly as they happened. Nor does dream interpretation reliably identify actual

²⁸² SIGMUND FREUD, *THE INTERPRETATION OF DREAMS* (1900).

²⁸³ D. F. HALL & R. L. VAN DE CASTLE, *THE CONTENT ANALYSIS OF DREAMS* (1966); Tore A. Nielsen & Russell A. Powell, *The Day-Residue and Dream-Lag Effects: A Literature Review and Limited Replication of Two Temporal Effects in Dream Formation*, 2 DREAMING: J. ASSOC. STUDY DREAMS 67 (1992).

events. Instead, research has shown that the process of dream interpretation can create false memories of events *suggested* by the interpretations.

Guiliana Mazzoni and her colleagues²⁸⁴ have shown that bogus dream interpretations (i.e., the same interpretation given to all subjects, regardless of the dream reported and with no reason to believe the interpretation applied to each subject) can lead to false memories for mildly traumatic suggested events.

Since Freud developed his theory of the unconscious and characterized dreams as the “royal road” to the unconscious mind, dream interpretation has been pervasive as a clinical tool, including as a tool for recovery of “repressed” memories. However, dream interpretation can be a suggestive enterprise. As Mazzoni’s work clearly demonstrated, incorrect suggestions or interpretations offered by therapists may lead to the development of false memories and beliefs. Although in most legal cases one cannot separate the influence of the many memory recovery techniques (since they tend to be used conjointly), dream interpretation has been among the techniques used in most cases of recovered memories of sex abuse,²⁸⁵ many later recanted.

h. Brain Damage and Source Amnesia

In some witnesses, susceptibility to source-monitoring errors is increased by injury. Source-monitoring errors are common, for example, among patients with some patterns of brain damage.²⁸⁶ In the extreme, such a patient may be able to learn new facts but be completely unable to remember the source of the information, even immediately after it is encountered. Patients without general amnesia who have damage to specific areas of the frontal lobes tend to show greater susceptibility to source amnesia.²⁸⁷ Such injuries can also be associated with extensive

²⁸⁴ Guiliana A. L. Mazzoni & Elizabeth F. Loftus, *When Dreams Become Reality*, 5 CONSCIOUS. & COGN. 442 (1996); Guiliana A. L. Mazzoni et al., *Creating a New Childhood: Changing Beliefs and Memories Through Dream Interpretation*, 13 APPL. COGN. PSYCHOL. 125 (1999); Giuliana A. L. Mazzoni et al., *Dream Interpretation and False Beliefs*, 30 PROF. PSYCHOL. RES. & PRAC. 45 (1999).

²⁸⁵ RENEE FREDERICKSON, *REPPRESSED MEMORIES* (1992); Loftus, *supra* note 94; LOFTUS & KETCHAM, *supra* note 94; Elizabeth F. Loftus, *Creating False Memories*, 277 SCI. AM. 70 (1997).

²⁸⁶ Daniel L. Schacter et al., *Retrieval Without Recollection: An Experimental Analysis of Source Amnesia*, 23 J. VERB. LEARN. & VERB. BEHAV. 593 (1984).

²⁸⁷ Jeri S. Janowsky et al., *Source Memory Impairment in Patients with Frontal Lobe Lesions*, 27 NEUROPSYCHOLOGIA 1043 (1989); SCHACTER, *supra* note 2.

false recollections of events that did not occur or could not occur.²⁸⁸ Such imagined events are called *confabulations*. More generally, right frontal lobe injuries appear to interfere with the ability to distinguish actual memories from convictions that something happened coming from another source, such as post-event publicity, conversations with others, or inferences based on other knowledge and expectations.²⁸⁹ In fact, some of the most severe cases of confabulation come from patients with both medial-temporal and frontal damage.²⁹⁰

Since head injuries and brain damage are common among accident victims of all types, it is important to consider the potential effects of any head injuries on memory, including susceptibility to source-monitoring errors. Those with increased susceptibility to source confusion will also be more susceptible to the common errors of witness memory resulting from failures of source monitoring.

i. Source Monitoring Problems in the Aging Witness

"When I was younger, I could remember anything, whether it had happened or not; but my faculties are decaying now, and soon it shall be so I cannot remember any but the things that never happened."

Mark Twain

Ever the astute observer of human nature, Mark Twain noticed in himself the now well-documented later-life difficulties in source monitoring. Noted memory researcher Henry Roediger recently summarized the documented vagaries of memory in old age as follows: "*Aging and Alzheimer's disease are a kind of double-edged sword. You are less likely to remember things that really did happen to you but you're more likely to remember things that never happened to you.*"²⁹¹ Perhaps already suffering the early devastations of Alzheimer's, Ronald Reagan provided a dramatic example of source dissociation on 60 Minutes during the 1980 presidential campaign. Repeatedly telling the story of a World War II bomber pilot who ordered his crew to bail out of his damaged

²⁸⁸ Brenda Milner et al., *Frontal-Lobe Contribution to Recency Judgments*, 29 NEUROPSYCHOLOGIA 601 (1991).

²⁸⁹ SCHACTER, *supra* note 2.

²⁹⁰ Alan D. Baddeley & B. Wilson, *Amnesia, Autobiographical Memory and Confabulation*, in AUTOBIOGRAPHICAL MEMORY 225 (D.C. Rubin ed., 1986); John DeLuca & Bruce J. Diamond, *Aneurysm of the Anterior Communicating Artery: A Review of Neuroanatomical and Neuropsychological Sequelae*, 17 J. CLIN. & EXP. NEUROPSYCHOL. 100 (1995).

²⁹¹ Henry Roediger, *quoted in* APA Monitor 38 (Oct. 2000).

plane while he remained behind with a young belly gunner who was too injured to jump, Reagan tearfully quoted the heroic pilot who told his crew, "*Never mind. We'll ride it down together.*" Reagan forgot, as the press soon discovered, that his story actually came from a scene in the 1944 film *A Wing and a Prayer*. While Reagan's error was doubtless much more noticeable than most, it was typical of source-monitoring errors common among the elderly, whether suffering from incipient Alzheimer's or not.

An understanding of the causes of age-related declines in memory functioning has accelerated exponentially with the advent of modern brain-imaging technology.²⁹² Research employing brain-imaging techniques has shown that normal aging is, on the average, associated with neuropathology in medial-temporal and frontal regions of the brain.²⁹³ Just as patients with damage to these areas suffer from source-monitoring difficulties, so do many older adults.

Older adults are less likely to remember contextual features of events such as the speaker, the color or type style of stimuli, the location of items, the origin of trivia facts, or whether something was seen in a video or a photograph.²⁹⁴ They are less able to remember *who* told them something and less able to remember what information they are supposed to keep secret and what they are not.²⁹⁵ They are somewhat less able to remember the gist of an event and much less able to remember the specific actions comprising the event.²⁹⁶

Older adults are particularly susceptible to false memories of having seen something that is *suggested* by the features of what they did see. They are more likely than younger adults to falsely believe they have seen or heard words, for example, that are semantically related to words they did see or hear or that rhyme with those that were presented.

One study specifically addressed the susceptibility of older adults to the "*misinformation effect.*" Gillian Cohen and Dorothy Faulkner²⁹⁷ showed a videotape of a kidnapping to older and younger adults. Later, half of each group read a written sum-

²⁹² SCHACTER, *supra* note 2, at 280.

²⁹³ Johnson & Raye, *supra* note 203, at 35.

²⁹⁴ See *id.* at 35; SCHACTER, *supra* note 2, at 280.

²⁹⁵ *Id.*

²⁹⁶ Robert J. Padgett & Hilary H. Ratner, *Older and Younger Adults' Memory for Structured and Unstructured Events*, 13 EXP. AGING RES. 133 (1987).

²⁹⁷ Gillian Cohen & Dorothy Faulkner, *Age Differences in Source Forgetting: Effects on Reality Monitoring and on Eyewitness Testimony*, 4 PSYCHOL. AGING 10 (1989).

mary of the event that contained misinformation, and the other half read an accurate summary. Older adults were more influenced by the misinformation than younger adults, frequently claiming that the misinformation had been part of the original videotaped event.

Further, the *reasons* underlying these source confusions include both the manner of encoding and difficulties in retrieving. Medial-temporal impairments appear to compromise the richness with which event memories are bound to contextual information during encoding, whereas frontal regions are more important for later retrieval and source attributions.²⁹⁸ Thus, source-monitoring difficulties have been shown to be greater among older adults with medial-temporal and/or frontal dysfunction with poorest performance among those who suffer from both.²⁹⁹ Memory for *sequence* depends upon frontal regions and accordingly becomes increasingly impaired with age.

Age appears to impair the richness of the images encoded at the time something is witnessed. Thus, when asked to recount recent episodes, older adults report less "*visual reexperiencing*" of the event than younger adults. They tend to offer descriptions that are relatively sketchy and incomplete while still feeling certain the event occurred.³⁰⁰ When retelling a story recently heard for the first time, older adults recalled less of the story than younger adults, told it less cohesively, and made more errors in retelling the story.³⁰¹

Common stereotypes suggest that the memories of elderly eyewitnesses may be inaccurate and tend to obstruct police investigations.³⁰² Jurors share these concerns.³⁰³ In fact, as compared to younger adults, older adults provide less accurate and

²⁹⁸ Johnson et al. *Source Monitoring*, 114 PSYCHOL. BULL. 3 (1993); Morris Moscovitch, *Confabulation*, in MEMORY DISTORTIONS: HOW MINDS, BRAINS, AND SOCIETIES RECONSTRUCT THE PAST 226 (Daniel L. Schacter, ed., 1995).

²⁹⁹ Elizabeth L. Glisky et al., *Double Dissociation Between Item and Source Memory*, 9 NEUROPSYCHOL. 229 (1995); Johnson & Raye, *supra* note 203, at 35; Mara Mather et al., *Stereotype Reliance in Source Monitoring: Age Differences and Neuropsychological Test Correlates*, 16 COGN. NEUROPSYCHOL. 437 (1999).

³⁰⁰ Shahin Hashroudi et al., *Aging and Qualitative Characteristics of Memories for Perceived and Imagined Complex Events*, 5 PSYCHOL. & AGING 119 (1990).

³⁰¹ Michael W. Pratt et al., *Telling Tales: Aging, Working Memory, and the Narrative Cohesion of Story Retellings*, 25 DEV. PSYCHOL. 628 (1989).

³⁰² A. Nicholas Groth, *The Older Rape Victim and Her Assailant*, 11 J. GERIATR. PSYCHIATRY 203 (1978).

³⁰³ A. DANIEL YARMEY ET AL., ATTITUDES OF JURORS TOWARD ELDERLY AND YOUNG ADULTS (1981).

less complete eyewitness reports,³⁰⁴ make more errors,³⁰⁵ and experience more difficulty in face recognition under some circumstances.³⁰⁶

Older adults are also more susceptible to the effects of *distraction* on memory apparently as a result of the effects of age-related declines in dopamine receptors on the functioning of working memory. Thus, already impoverished encoding may be further impaired by distractions or other failures of attention.³⁰⁷

Schacter³⁰⁸ suggested that this impoverished encoding may be responsible for the age-related decline in the incidence of "flashbulb" memories.³⁰⁹ He noted that a flashbulb memory, by definition, includes details about its source. Age-related declines in richness of encoding provide less contextual information to help the person retrieve the memory.

Advancing age may also alter the criteria by which we judge the reality of a memory. For example, both older and younger people judge the reality of a memory in part on the basis of how clear it seems. As noted earlier, however, older adults tend to encode less detail. Remembering fewer details of recent experiences, the elderly may rely more on general feelings of familiarity to judge whether something happened or not.³¹⁰ Older people give greater weight than younger people to the emotional power of memories when judging their validity.³¹¹ Marcia Johnson and Carol Raye³¹² suggest that older adults may require less perceptual information to convince them a memory is real,

³⁰⁴ Judith A. List, *Age and Schematic Differences in the Reliability of Eyewitness Testimony*, 22 DEV. PSYCHOL. 50 (1986); A. Daniel Yarmey, *Age as a Factor in Eyewitness Memory*, in EYEWITNESS TESTIMONY 142 (Gary L. Wells & Elizabeth F. Loftus eds., 1984); A. Daniel Yarmey, *The Elderly Witness*, in PSYCHOLOGICAL ISSUES IN EYEWITNESS IDENTIFICATION 259 (S.L. Sporer et al. eds., 1996); A. Daniel Yarmey & Judy Kent, *Eyewitness Identification by Elderly and Young Adults*, 4 LAW & HUM. BEHAV. 359 (1980).

³⁰⁵ LOFTUS & DOYLE, *supra* note 11, at 75.

³⁰⁶ A. Daniel Yarmey, *Adult Age and Gender Differences in Eyewitness Recall in Field Settings*, 23 J. APPL. SOC. PSYCHOL. 1921 (1993); Yarmey, *The Elderly Witness*, *supra* note 303, at 259.

³⁰⁷ SCHACTER, *supra* note 2, at 280.

³⁰⁸ *See id.*

³⁰⁹ Gillian Cohen et al., *Flashbulb Memories in Older Adults*, 9 PSYCHOL. AGING 454 (1994).

³¹⁰ SCHACTER, *supra* note 2, at 280.

³¹¹ Hashtroudi et al., *supra* note 299, at 119; Marcia K. Johnson & Kristi S. Multhaup, *Emotion and Memory*, in THE HANDBOOK OF EMOTION AND MEMORY: RESEARCH AND THEORY 33 (S.A. Christianson ed., 1992).

³¹² Johnson & Raye, *supra* note 203, at 35.

but may weight emotional detail more heavily because they find the emotional aspects of events more interesting.

As we continue to learn more about the interrelationships of memory and brain function, further age-related changes in the functioning of memory will no doubt be identified. Meanwhile, it is important to consider age when evaluating the potential for post-event contamination of witness memory. Both the extremely young and the extremely old will tend to suffer greater distortions from failures of source monitoring. In the elderly, problems of source monitoring will vary greatly in magnitude as a function of declines in brain function. Thus, while being aware of the potential for impaired memory, one should not assume all elderly will suffer such declines.

3. *Minimizing Bias Through the "Cognitive Interview"*

Investigative interviewing tends to be both leading and coercive in nature (and sometimes hostile). For example, one analysis of a large number of police interviews was found to contain, on the average, only three open-ended questions.³¹³ Further, if a witness began to give narrative responses, they were interrupted within an average of 7.5 seconds. Generally, police and investigators tend to ask too many closed-ended questions and too few open-ended questions, to interrupt the witness in the middle of narrative accounts, to ask questions in a predetermined order without regard for continuity for the witness's report, and to ask leading and suggestive questions.

Based on this and other analyses of police interviews, Ronald Fisher and Ed Geiselman began to apply psychological knowledge to develop interviewing techniques that would maximize both the *quantity* and *quality* (accuracy) of witness reports.³¹⁴ Among their recommendations are the following:

First, the interviewer must try to encourage the witness to have the motivation to report what (s)he knows and give the witness the opportunity to tell everything (s)he knows. To do this, the investigator should develop rapport with witnesses and allow them to talk openly and freely without interruptions. Closed-ended questions should be kept to a minimum. Instead, open-ended and non-suggestive questions should be used, and

³¹³ Ronald P. Fisher et al., *Critical Analysis of Police Interview Techniques*, 15 J. POLICE SCI. (Admin. 17) (1987).

³¹⁴ FISHER & GEISELMAN, *supra* note 191.

the witness should be allowed plenty of time to complete answers without interruption.

Second, the cognitive interview is designed to incorporate principles of memory and retrieval that will help the witness remember without distorting the memories in the process. To facilitate retrieval of difficult or traumatic memories, the interviewers should conduct the interview at a slow pace and ask few, primarily open-ended, questions.

When the witness has difficulty remembering a particular detail, a trained cognitive interviewer will be able to provide non-distorting memory aids. These include reminding the witness of other features of the event known to be accurate or encouraging the person to begin to recall through many different retrieval pathways (or starting points). A trained cognitive interviewer will also attempt to understand the witness and how that witness thinks about the event so that (s)he will be able to ask questions that will be most helpful to the specific witness. Finally, the interviewer will make use of other means of expressing memories, such as sketching figures or scenes.

The cognitive interview has been tested in many laboratories against more traditional interviews, and has elicited between 35% and 75% more information without increasing incorrect responses.³¹⁵ Two field studies with real witnesses mirrored those of the laboratory studies with 55% and 35% increases in the amount recalled.³¹⁶

The success of the cognitive interview is encouraging. However, it remains to induce police and other investigators, as well as therapists and others who interview witnesses, to conform to similar practices.

VIII. HOW CAN THE MEMORY EXPERT HELP?

Memory experts can be of assistance to attorneys either as expert witnesses to explain basic memory processes and the circumstances under which memory tends to fail to the jury, as damage experts, or as consultants to help the attorney prepare for trial.

³¹⁵ Ronald Fisher & M.L. McCauley, *Information Retrieval: Interviewing Witnesses*, in *PSYCHOLOGY & POLICING* 81 (N. Brewer & C. Wilson eds., 1995). G. Kohnken et al., *The Cognitive Interview: A Meta-Analysis*, 5 *PSYCHOL., CRIME & L.* 3 (1999).

³¹⁶ Roy P. Fisher et al., *Field Test of the Cognitive Interview: Enhancing the Recollection of Actual Victims and Witnesses of Crime*, 74 *J. APPL. PSYCHOL.* 722 (1989); R. George & B.R. Clifford, *Making the Most of Witnesses*, 8 *POLICING* 185 (1992).

A. TESTIMONY AS AN EXPERT WITNESS

1. *To Provide Context For Jury Evaluation of Witness Accuracy*

The most common use of memory experts has been to provide understanding to the jury of how memory works and how and under what circumstances it might fail. Most frequently, this has occurred when an eyewitness has identified a suspect as the perpetrator of a crime. The memory expert is asked to explain to the jury: (a) that eyewitness testimony is less reliable (in general) than jurors tend to assume; and (b) the nature of witness, event or post event factors that tend to be associated with more or less accurate memory.³¹⁷

2. *To Provide Context For Jury Understanding of Traumatic Failures of Memory*

Memory experts have also been called to provide understanding of trauma-induced failures of memory in order to provide the context for evaluation of a victim's testimony. For example, testimony regarding "*rape trauma syndrome*"³¹⁸ might be offered to explain the victim's failure to remember details of the event or to explain inconsistencies in her memory. The testimony is offered to explain to the jury that some failures in memory or inconsistencies do not reflect general inaccuracy in the rest of the reported memories. Long-term memory deficits in victims of prolonged stress, such as in victims of child sex abuse or in war veterans, may also be addressed and explained to support claims of liability.

3. *To Support or Question Claims for Damages*

Memory experts may be of use to provide expert testimony either in support of claims of damages or to question them.

a. *To Support Claims for Damage to Memory*

Modern neuroscience has progressed exponentially in understanding the physiological bases of memory. Each day, more is learned about specific brain processes and structures involved in

³¹⁷ For a review of the nature of expert testimony on eyewitness issues, and the evidence supporting its effectiveness in causing the jury to more accurately differentiate between accurate and inaccurate witnesses, see Michael R. Leippe, *The Case for Expert Testimony About Eyewitness Memory*, 1 PSYCHOL. PUB. POL. & L. 909 (1995).

³¹⁸ P.A. Frazier & E. Borgida, *Rape Trauma Syndrome: A Review of Case Law and Psychological Research*, 16 LAW & HUM. BEHAV. 293 (1992).

and necessary for memory processes. In part, this understanding includes: (1) how psychological trauma can temporarily or permanently affect the structure and functioning of the brain and (2) how physical damage to the brain affects memory.

1. *Long Term Effects of Psychological Trauma and Stress on Brain and Memory*

Severe trauma and/or prolonged stress has recently been shown to permanently alter brain structure and function. For example, recent imaging studies have shown deficits in hippocampal volume both in subjects with PTSD (which would be expected in most victims of aviation disasters) and in women exposed to abuse in childhood. Others have shown deficits in other areas of the brain (for example, in cortical functioning). These areas of the brain are crucial to memory processes. Even long-term stress in the absence of trauma can compromise memory functioning.³¹⁹

Thus, memory experts may be of assistance through testimony regarding the damage to memory that can result from psychological trauma, explaining both the potential extent of damage to memory and the effects of trauma on the brain that underlie declines in memory functioning.

2. *Long-Term Effects of Brain Injury on Memory*

Both medical/biological and psychological investigators have begun to provide great understanding of the relationship between the brain and memory.³²⁰ Thus, where the nature of brain damage can be specifically established, memory (or generally, neuroscience) experts can provide testimony regarding the impact of specific brain damage on memory as well as other cognitive functions.

Interestingly, although such testimony tends to be offered more frequently in support of claims of damage in cognitive functioning, it can also be useful to dispute such claims when the nature of the damage claims are inconsistent with the nature of the brain damage. In other words, depending upon the precise injuries and claims involved, modern knowledge of the relationship of brain injury to cognitive dysfunction can aid in the detection of false damage claims.

³¹⁹ SUSAN J. BRADLEY, AFFECT REGULATION AND THE DEVELOPMENT OF PSYCHOPATHOLOGY 36 (2000); SCHACTER, *supra* note 2, at 8.

³²⁰ SCHACTER, *supra* note 2; Schacter, *supra* note 2, at 182.

b. To Question Claims for Other Damages

*"Since my past only truly exists in the present and since my present is always in motion, my past itself changes too—actually changes—while the illusion created is that it stays fixed."*³²¹

Plaintiffs and those close to them must provide accounts of the changes in physical and mental functioning, work, family relationships and lifestyle in support of their damage claims. Memory experts may be of use either to testify regarding common distortions in reports of behavior changes and functioning or to help the attorney identify and understand this potential.

The very nature of autobiographical reports of change requires both accurate memory for the past and accurate understanding of the present. In fact, both are problematic.

Memory of the past is often inaccurate. As discussed previously in the sections on constructive and reconstructive memory processes, memory for the past can be distorted, among other things, by current motivations and beliefs. In fact, both memory for the past and perceptions of the present are distorted by many factors, including self-serving motivations. Anthony G. Greenwald,³²² in an article entitled "*The Totalitarian Ego: Fabrication and Revision of Personal History*," argued that personal history, similar to the revisionist historical practices of totalitarian regimes, is continually revised in light of current motivations. Subsequent research has clearly demonstrated that current motivations can bias autobiographical memory.³²³ The motivations activated by a lawsuit and desire to prove damages clearly provide a significant source of potential distortion.

However, other factors present for most plaintiffs may similarly distort memory for changes in behavior and functioning. For example, *causal schemas*, referring to implicit theories about what causes what, have been shown to distort autobiographical memory.³²⁴ If a plaintiff or those close to him or her, including treating experts, *believe* that an injury of the sort sustained by the plaintiff is likely to cause effects such as changed personality, loss of memory, changes in sexual functioning, and so on, such

³²¹ B.J. Mandel, *The Past in Autobiography*, 64 SOUNDINGS 75, 77 (1981).

³²² Anthony G. Greenwald, *The Totalitarian Ego: Fabrication and Revision of Personal History*, 35 AM. PSYCHOL. 603 (1980).

³²³ KUNDA, *supra* note 53, at 342; Rasyid Sanitioso et al., *Motivated Recruitment of Autobiographical Memories*, 57 J. PERS. & SOC. PSYCHOL. 539 (1990).

³²⁴ Michael Ross & Anne E. Wilson, *Constructing and Appraising Past Selves*, in MEMORY, BRAIN, AND BELIEF 231 (Daniel L. Schacter & Elaine Scarry eds., 2000).

a belief will tend to cause memories of the plaintiff's condition or behavior to be distorted to indicate better functioning than actual before the injury and worse functioning than actual after the injury. The witness may be an "*honest liar*" in this respect, as people are generally subject to the distorting effects of expectations based on causal schemas and honestly believe in the changes they perceive.³²⁵

Reports of *patterns* of behavior, as opposed to specific incidents, are also subject to error. Michael Ross, a noted expert on autobiographical memory, illustrated this problem in the description of his attempt to respond to a survey on health and lifestyle. Just as plaintiffs are often asked these types of questions, he was asked how many hours per week, on average, he had spent on various activities and how frequently he had eaten various foods in the past year and during different preceding periods of his life. He was also asked to report current as opposed to previous personal characteristics such as weight.

Noting that he found these questions very difficult to answer, Ross³²⁶ went on to address the reasons for his difficulty. He pointed to the fact that such questions cannot be answered by simple retrieval of stored memories. Few people have stored the frequencies with which they engage in activities or eat particular foods. Such answers have to be *constructed* from other memories *that can be brought to mind* in combination with attempts to somehow mathematically average them across time.

Also, consistent with research on the "*retrospective bias*," Ross noticed that his memory and certainly his reports were colored by the desire to report what he knew he should have been doing. His answers were "*constructions, reflecting his beliefs, preferences, and guesses, as well as his retrieval of stored memories.*"³²⁷

As Ross' problem answering his lifestyle questionnaire illustrates, it is generally very difficult for people to accurately report on patterns of behavior, whether past or present. This problem commonly plagues research on medical issues regarding diet, lifestyle, and health and plaintiff reports of damage alike.

³²⁵ Sissela Bok, *Autobiography as Moral Battleground*, in MEMORY, BRAIN, AND BELIEF 307 (Daniel L. Schacter & Elaine Scarry eds., 2000); Eakin, *supra* note 4, at 291; DAVID MIDDLETON & DEREK EDWARDS, COLLECTIVE REMEMBERING (1990); Ross & Wilson, *supra* note 323, at 231; RUBIN, *supra* note 157.

³²⁶ Ross & Wilson, *supra* note 323, at 231.

³²⁷ *Id.*

B. CONSULTATION

1. *Providing Understanding of Potential for Errors of Memory/ Perception*

Memory experts are sometimes hired to explain the circumstances under which memory will tend to be inaccurate in order to help the attorney evaluate the testimony of witnesses for his or her case. This assistance may help the attorney to identify witnesses who may be partially or wholly inaccurate about what they remember. The attorney may then decide whether to retain a memory expert to testify to the jury regarding the potential pitfalls in memory.

2. *Preparation for Cross Examination of Witnesses*

Finally, once potentially inaccurate witnesses are identified, the attorney may retain a memory expert to assist with the preparation of cross-examination of those witnesses. A number of points regarding the potential for inaccuracy may be made through cross-examination without the necessity of expert testimony. The memory expert might write a script for cross-examination in order to express the potential for distortion clearly.

