

THE TRANSCIENCE OF MEMORY:

We Really Can Remember It for You Wholesale

Richard A. Lovett

The 1990 movie "Total Recall," based on the Philip K. Dick novellette "We Can Remember it for You Wholesale," envisions a future in which memories can be implanted well enough for you to "remember" a vacation (in the story, a trip to Mars) without actually taking it. As with other tales of hypnosis, brainwashing, and dream worlds, the story's power comes from the questions it raises about truth, fantasy, and the reliability of memory. These stories all ask the same chilling question: What would it be like if we couldn't distinguish true memories from false ones?

The answer isn't as deeply in the realm of science fiction as we might like to believe. Memory is notoriously slippery, and events we'd swear we witnessed might not have happened the way we remember. They might not have happened at all. This is a particular problem for childhood memories—even important ones which, when recovered in adulthood, may form the basis of long-after-the-fact accusations for crimes such as child abuse. How do we know

whether these memories are accurate?

Consider the case of Donald Thompson, an Australian psychologist who, in the 1980s was accused of rape. The evidence against him was very simple: the victim vividly remembered *him* as her attacker and could easily have picked him out of a lineup. But her memory *had* to be distorted, because Thompson had an ironclad alibi. At the time of the attack, he was on live television—talking, ironically, about memory and memory distortion. The victim had been watching the program when she was attacked, and had merged Thompson's face into her traumatized memory of the event.¹

According to Daniel L. Schacter, chair of the Department of Psychology at Harvard University, there are seven basic types of memory imperfections. In his book, *The Seven Sins of Memory*, Schacter catalogs them as transience, persistence, absentmindedness, blocking, bias, misattribution, and suggestibility.

The first four are related to forgetfulness. Of these, transience is the simplest. When I was in grade school, I

could recite the capitals of all 50 states and list all U.S. presidents, with dates. Today, I'd botch up quite a few. Where did that information go?

Even relatively recent memories suffer from transience. Try the following experiment: engage a friend in conversation, taping the discussion for later reference. Whenever your friend says something pithy, write it down, trying for a direct quote. If you're like most people, you'll be lucky to get beyond the fifteenth word before you start diverging from what's on the tape. Even trained reporters usually veer into paraphrase by word twenty-five, and with each successive word, the paraphrase gets worse.² Putting this to the test is a humbling experience: you *know* what was said—you can almost hear it echoing around your brain, but it slips away faster than you can scribble it down. Worse, it slips away faster than you think it does, which is why it's easy for well-intentioned reporters to misquote people.

The opposite of transience is persistence: the inability to forget things you'd really prefer not to remember. It could be as innocuous as the tune you can't get out of your head, or as severe as posttraumatic stress disorder.

Absentmindedness and blocking are also common. You absentmindedly tune me out for a paragraph and can't remember what I said; you promise that you'll mow the lawn . . . and you really *did* mean to do it. In blocking, you know something and *know* that you know it—it's on the tip of your tongue—but you just can't quite find it because the memory is temporarily inaccessible. Blocking is disconcerting be-

cause it increases with age, making you fear you're getting Alzheimer's, but it's normal, even if not well understood.

But the main topic of this article is memory distortion, which Schacter considers in his last three categories: bias, misattribution, and suggestibility.

Bias is the interpretation of memory in light of current knowledge and beliefs. It might be hard for me to accurately recall what it felt like prepare for a crucial exam that I subsequently aced. Was I as confident of doing well, as I now think I was, or is that memory colored by my knowledge that I actually did do well?

Misattribution is what nearly put Thompson in jail for a crime he didn't commit. Again, we all do this to some degree. A year from now, you may remember reading this article, but you may think someone else wrote it, or forget whether it was in *Analog* or *Scientific American*. Misattribution is a big deal when it leads to erroneous criminal charges, but merely a nuisance when it causes you to waste time looking in the wrong places for citations.

Both of these are important, but suggestibility is by far the most interesting memory distortion. It is nothing less than the implanting of false memories—by accident or design. And these memories can be so vivid that people would swear on a stack of Bibles that they're accurate, even, in some cases, when they're frankly impossible.

There are several ways to distort memory. Schacter has experimented with this via simple word tests, using a method dating back to the late 1950s. Volunteers are asked to study a list of

¹ From Daniel L. Schacter, "The Seven Sins of Memory: A Cognitive Neuroscience Perspective," presentation at the 2003 annual meeting of the American Association for the Advancement of Science. See also, Steve Grant, "How Not to Forget: Memory Aids Can Help Keep Thoughts From Slipping Away," *The Hartford Courant*, September 8, 2002.

² As a journalist, I myself have done this "experiment" countless times whenever I play back an interview tape against my written notes. The results make me leery of using extended direct quotes unless I'm transcribing them from a tape.

words, centering on a "theme" word that's not actually presented. For example, the list might be *candy, sour, sugar, bitter, good, taste, tooth, nice, boney, soda, chocolate, heart, cake, eat, pie*. Study participants are then tested on their memory of the list by being presented with words, one at a time, and asked to identify them as "old," if they were on the original list, or "new" if they weren't. With the above list, most people will accurately identify something like *horse* as new, but many will be sure that *sweet* was on the list, when actually it wasn't. The reason: *sweet* is the theme word around which all of the others centered, and the list is designed to get you thinking about sweetness without actually using that word.

Schacter views this as a type of misattribution: you yourself are thinking about sweetness, and misattribute your own thoughts to the actual contents of the list. But it's also a very simple form of implanted memory in which the experimenter carefully leads you down the garden path to a tempting but false conclusion.

That, of course, is a far cry from fabricating a trip to Mars. But other researchers have experimented with considerably more detailed memories. Michelle Leichtman, a researcher in the Department of Psychology at the University of New Hampshire, conducted a now-classic experiment with young children in which several kindergarten and pre-school classes received a visit from a man introduced simply as Sam.³

Sam's visit was very straightforward. He walked into the classrooms, looked around, and left, without saying or doing anything else. But beforehand, different classes had been told different stories about what to expect. Some had been told nothing other than the simple fact that Sam would visit; others received detailed depictions of him as

bumbling but kind, presented as stories of funny things Sam had done on other occasions.

Five weeks later, the children were asked to recall Sam's visit. When asked nothing but open-ended questions, those who'd not been given the bumbling-but-kind stereotype responded with accurate memories. But some of those who'd been prepped to expect clumsiness produced memories in line with that expectation.

Other children, including some who'd been prepped to expect clumsiness and some who weren't, were guided through their memories of Sam's visit with inaccurate, leading questions, such as: "Do you remember when Sam accidentally tore a page out of the book? What was he wearing when he did that?" A few of the control-group children fell for this trick. But among those who'd been told to expect clumsiness, so many remembered such false incidents that Leichtman calls the implications "alarming" for the use of poorly recovered childhood memories as testimony in sex abuse cases. Overall, she says, leading questions, when combined with misleading suggestions previously implanted by adults, can powerfully distort children's memories. Worse, the children's reports of their now-false memories can be compelling, detailed, and remarkably durable.

Take Me to Your Leader

Children aren't the only ones who can suffer from this. Richard McNally, a professor of psychology at Harvard University, argues that UFO abductees have experienced something very similar in adulthood.⁴ The process is more complex, he says, but the end results are memories so deeply engrained that the abductees may even appear to suffer post-traumatic stress symptoms similar to those experienced by Vietnam veter-

ans or sex-abuse victims.

McNally began his study by running an ad in the Boston Globe asking, "Have you been abducted by aliens?" After screening out the jokesters and those who thought he was talking about forgers, he wound up with six women and four men, average age 48, who convinced him that they truly believed they'd been abducted.⁵

On psychological profiles, these people looked perfectly ordinary, except for a few signs of post-traumatic stress. They weren't depressed, anxious, or in any way psychologically abnormal. They did, however, test high in "absorption," a personality trait that allows you to become deeply engrossed in whatever has caught your attention, such as the imaginary world of a good novel. (In other words, these people sounded a lot like *Analog* readers.⁶) They also showed "a whiff" of *magical ideation*, which McNally describes as "belief in unconventional modes of causation," and they tended to be interested in New Age topics such as tarot, astrology, ghosts, and unusual forms of alternative medicine—a collection of interests that McNally lumps together as reflecting a preexisting belief in the paranormal.

McNally believes that his abductees' experiences all began with a phenomenon called *sleep paralysis*, combined with *hypnopompic hallucinations*—a term that simply refers to dreamlike visions occurring during the transition from sleeping to waking.⁷ Both are actually quite normal, he says—no more

dangerous than a case of hiccups—but they're extremely frightening and produce vivid, inexplicable memories.

Sleep paralysis ordinarily occurs during our dreams to keep us from running around acting them out, and injuring ourselves in our sleep. Usually, the paralysis fades before we wake up. But that doesn't always occur; about one person in three has occasionally awakened before the paralysis has worn off.

When this happens, the dream state can linger into wakefulness, producing vivid hallucinations that we remember much better than we do our normal dreams. A friend of mine calls these "waking dreams." In his case, they tend to happen when he's camping in the wilderness. He wakes up paralyzed, convinced that wild animals are prowling around his tent. Still paralyzed, he fades back to sleep, but in the morning, he has a such a powerful memory of wolves, bears, or lions that he's wanting to search for tracks.

The classic alien abduction tale has much in common with my friend's nocturnal visitations by animals: *I woke up paralyzed, felt a presence*, etc. In fact, if my friend had been an *X-Files* believer, he might have put a quite different spin on his own experiences. McNally claims that abductees, with their strong abilities to focus on particular lines of inquiry and pre-existing New Age beliefs, become understandably interested in finding out what happened to them. Often, they use hypnosis or other therapies that take them back to the time of

⁴ Another Harvard researcher, John Mack, believes that alien abductions are real. See Kaja Perina, "Cracking the Harvard X-Files," *Psychology Today*, March/April 2003, pp. 66-76, 95. McNally's research is interesting, regardless of whether you believe in alien abductions or not.

⁵ Richard McNally, "Remembering Trauma," presentation at the 2003 annual meeting of the American Association for the Advancement of Science.

⁶ I myself would probably test high on absorption, as is evidenced by the fact that I wrote the first draft of this article sitting in a Starbucks surrounded by conversations that I automatically tuned out to pay attention to my own work.

⁷ Hypnopompic hallucinations are ones that occur on waking. The opposite are hypnagogic hallucinations, which occur when one is falling asleep.

³ Michelle Leichtman, "Memory in Children," presentation at the 2003 annual meeting of the American Association for the Advancement of Science.

the event, perhaps with leading questions derived from the therapist's own UFO beliefs. The abductees then "recover" the entire alien-abduction mythos, complete with sexual experimentation designed to produce a human-alien hybrid race, and all the other trimmings. But instead of recovering real memories, McNally says, they've had false ones implanted—created by their own imaginations from the powerful hallucinations they had during sleep paralysis, and sometimes reinforced by suggestive forms of memory recovery therapy. Sleep paralysis and hypnopompic hallucinations aren't new, McNally adds. Other cultures simply plugged them into a different mythos, producing tales of witches and demons.⁸

Subliminal Effects

Another form of mind manipulation is subliminal advertising. The concept dates back at least to Freud, and has also been kicking around science fiction for a long time, but it garnered new interest in 2000, when one campaign was accused of inserting the word "rats" into political ads, in an effort to program voters' subconscious minds with reflexive dislike of the opposing candidate.

Subliminal advertising works by flashing pictures or text more rapidly than the conscious mind can process them. Not only are people's minds being programmed, but the victims are unaware of being manipulated. Following the 2000 presidential campaign, Joel Weinberger of Adelphi University's Derner In-

stitute in Garden City, New York, decided to test whether this actually worked by setting up a website on which people rated a hypothetical political candidate, after being flashed with one of four subliminal messages. Those messages were "RATS," "STAR" (rats spelled backward), ARAB, and XXXX (a neutral control).⁹

The study proved that people really don't like rats. "STAR," which could be viewed as praise, had little effect, as did "ARAB" (good news for those concerned about anti-Arab bias), but RATS substantially lowered the viewers' impression of the hypothetical candidate.

A more complex experiment, conducted in the laboratory, examined the reaction of people to the subliminal message "MOMMY AND I ARE ONE." Prior research had indicated that if people are given subliminal flashes of this message and then asked to recall their childhoods, it often increases their tendency to remember good events. But other studies had found that the same message can promote bad memories.

Weinberger hypothesized that the subliminal message was actually received in both situations, but that the results depended on whether people had good or bad childhood experiences with their mothers. To test this, he recruited a new group of study subjects and gave them a sociological test designed to assess their relationships with their mothers. Then, after stimulating some with the Mommy message, he asked everyone to write down memories from their childhoods. The goal

wasn't to have them write complex essays, but simply to produce lists, such as, "I got a puppy for my birthday," "I went to summer camp," "We moved across town," "My sister fell off a horse and broke her collarbone," "My parents got divorced." After a few minutes, time was called, and the test subjects were asked to rate each memory as good or bad, on a multi-point scale. Those who'd revealed positive childhood experiences with their mothers on the sociological exam responded positively to subliminal stimulation with "MOMMY AND I ARE ONE." Those who had poor experiences in childhood didn't take comfort from that message but were instead induced to recall a higher than normal level of bad memories.

It's not an earthshaking finding, but the Mommy test does reveal some interesting things about subliminal messages. On the most superficial level it's another confirmation that subliminal messages do indeed work—the mixed results of earlier studies were simply due to an overlooked variable. But on a more complex level, it means that the effects of subliminal messages may vary, depending on what type of images they provoke in each recipient. Folks like Willard, the rat-loving outcast in the horror movie of the same name, would probably vote for a candidate about whom they'd been subliminally programmed with messages about rats! An interesting science fictional angle on this might involve a subliminal manipulation program that is uncovered when it backfires in exactly this manner, by inducing a subset of the population to do the precise opposite of what the advertisers intended.

¹⁰ Full-blown brainwashing of unwilling subjects, carried out over the course of a considerable length of time, might be a different matter, but that is beyond the scope of this article.

¹¹ "Elizabeth F. Loftus, "Putting Memory Meat on the Bones of Belief," presentation at the 2003 annual meeting of the American Association for the Advancement of Science.

Kissing the Frog

However powerful they are, subliminal messages appear to be quite limited in scope. In the MOMMY AND I test, the messages affected the subjects' attitudes about their childhoods, but did not strongly alter the content of their memories. Those who'd been flashed with MOMMY AND I ARE ONE did not have larger numbers of Mother-related memories. Thus, while subliminal messaging might be used to make you *want* to go to Mars, it's not a promising method for causing you to remember a nonexistent trip.

Currently, in fact, there does not appear to be an easy way to implant detailed memories in people who are aware of the process.¹⁰ But just as Leichtman has proven that it's possible to use leading questions confuse the memories of young children, Elizabeth Loftus, a memory researcher at the University of Washington, has demonstrated that it is possible to implant some truly astounding memories in adults who are unaware that they are being manipulated.¹¹ These memories, she found in a series of studies reported in early 2003, can be extremely detailed, and while research ethics prevent the researchers from tinkering with anything but relatively trivial memories, there's no reason that similar techniques couldn't be used for considerably more sinister purposes.

In one study, adult volunteers were given a variety of objects, such as pink scissors or a toy frog. They were encouraged to play with these objects in whatever innovative fashions came to mind, while the researchers kept track of what they did. The following day, and on as many as four additional follow-up sessions, the subjects were asked to

Imagine doing additional things with these objects. These imagining sessions might contain a considerable amount of sensory detail, such as "Imagine kissing the frog. Imagine the color of the frog and the feel of it against your lips." Some of the imagined actions were familiar, such as flipping a coin. Others were truly bizarre, such as crushing a Hershey's Kiss with a stapler.

Two weeks later, the study participants were asked to report what they'd actually done with the objects. Fifteen percent remembered one of the imagined activities as real—including kissing the frog.¹² Fifteen percent might seem like a low number, but remember, these people had been convinced that they'd kissed a frog or stapled a Hershey's Kiss, simply by being asked to imagine what doing so might feel like. Imagination is an extremely powerful force.

Memory Bugs

A second study applied a more subtle approach to the same end, although in this case the memories were long-ago events from childhood. Loftus recruited volunteers by telling them that she was seeking people to critique advertisements. But, like many psychology experiments, the true purpose was hidden.

Her ad critics were then shown a series of ads, including one touting the pleasures of Disneyland. The Disney ad contained a prominent picture of Bugs Bunny, along with text talking of how shaking hands with him is the type of event that can make a child's day. There was only one hitch: Bugs is a Warner Bros. character who would never be found in Disneyland.

People who spotted this fallacy were labeled as "Bugs detectors" and dropped from the study. The rest were asked if

they remembered meeting Bugs on their own childhood visits to Disneyland. Sixteen percent¹³ said "yes."

Then the study was repeated by having the subjects examine not one, but three Bugs-containing ads. Now, 36 percent remembered meeting Bugs. When pressed for details, 62 percent of those said they shook his hand, 40 percent hugged him, and at least one heard him say, "What's up doc?" Again, using a very simple ruse, Loftus and her colleagues had persuaded a startling percentage of people that they'd had impossible experiences.

A third study took on the belief that memories of traumatic impacts are so strong that they're immune to such manipulation. To test this, Loftus interviewed Russians about their memories of a 1999 apartment complex bombing in which 230 people died—an event that shocked their country in much the way that the World Trade Center attacks of 2001 shocked Americans.

The Russians were first interviewed in March, 2002, two-and-a-half years after the attack. Using non-leading questions, the researchers asked them to recall what they remembered of that fatal day. Six months later, the subjects were re-interviewed, but this time the interview included a leading question regarding a detail that none of them had reported the first time, and that had not appeared on any of the news coverage of the event. Specifically, they were told: "Earlier, you mentioned a wounded animal. Do you still remember it?"

A full one-eight of these people responded with some form of "Oh, yes." When asked to elaborate, they produced remarkably detailed memories of events that never occurred: "recalling" images such as "a bleeding cat, lying in

the dust," "a lost parrot in a cage," or "a crazed dog, barking and rushing around the police officers." Again, one person in eight might not sound like many, but how many of us are sure we'll never forget all the details of what we saw on the media coverage of the World Trade Center attacks? Loftus' research indicates that some of us could easily be led to invent details—and that these inventions could, at least in general terms, be guided by a stranger who was attempting to manipulate us. To me, that's deeply disturbing.¹⁴

Overall, Loftus says, there are three basic steps to implanting false memories:

1. Make the potential event plausible. It doesn't have to be something that the person is predisposed to believe—as in McNally's alien abduction memories—but it does have to carry the ring of potential truth. People who couldn't imagine themselves being uninhibited enough to crush a Hershey's Kiss in the stapler aren't going to be easily faked into believing they did it.

2. Create a belief that the event actually happened. Each of her experiments did this in a different way, but in all of them that was one step in the process.

In one case it was done by leading questions; in another it was by guided imagining sessions. In the third it was by creating a scenario (the Bugs Bunny ads) in which people's imaginations were likely to run in the desired direction without any other outside urging.

3. Embellish the belief with sensory detail.

This is not a purely theoretical exercise. In 2002, Loftus suggests that the entire population of the D.C. area was an unwitting subject in an accidental memory experiment, triggered by a report linking the Beltway snipers to a white van.

When the snipers were finally caught, it turned out that they did not own such a van. But from the moment the first van sighting was reported, white vans were seen regularly throughout the manhunt. Yes, such vans are common vehicles. But the frequency and the urgency of the sightings indicates that the expectation of seeing them became part of the terrorized area's collective imaginations.

The world of "Total Recall" might not yet exist, but when it comes to mass hysteria, our collective memories really can be created wholesale. ■

¹⁴ At the same time, I'm not all that surprised by this finding. In 1979, I was on the receiving end of what appeared to be an attempted murder, in which an armed robber marched a companion and me into the woods with the probable intention of shooting us. My companion and I escaped by running in different directions, where we were soon screened by heavy brush.

My memory of the event is full of vivid details. But in late 2002 I had opportunity to revisit the scene of the attack, and was startled to discover that I had trouble recognizing the terrain. In part, that was because the land had changed. Wilderness had turned into five-acre home sites; vegetation had grown and changed; a nature trail had been built where previously there had been none; roads had been paved and realigned. But the bottom line was that I remembered running a "very long" distance "that way," and "that way" led rather quickly to a hillside that I knew I'd not descended. While I was running—expecting to be shot in the back at any moment—my time sense had been totally warped. Seconds had felt like minutes, and I'd run a lot less distance than I'd thought.

If my memory of such a trauma can be so difficult to reconstruct, with no external manipulation (other than the erasure of landmarks by that subdivision), then I have no doubt that Loftus' results are real—and probably on the conservative side of what is possible.

¹² This figure is for people who received five imagining sessions. People who received fewer sessions responded more weakly.

¹³ So did 7 percent of the control subjects, whose memories had not been contaminated by the ad. Some people simply have poor memories or are so anxious to please the researcher that they'll say just about anything.