What were you doing on 9/11 when you heard about the attacks? How well you remember may depend on how directly you were affected that day, new research suggests.

BY BRIDGET MURRAY LAW

Millions of Americans have vivid remembrances of decades-old traumatic events, including John F. Kennedy's assassination, the Challenger space shuttle explosion and, more recently, the 9/11 attacks. Known as "flashbulb memories," these detailed recollections can be as clear as something that happened yesterday, right down to the dialogue, the weather and even what people were wearing when they heard the news.

"What makes these events so memorable is the unusual intersection of the personal and the public, so that what becomes salient for you is actually learning about the event, in addition to the facts of it," says cognitive psychologist William Hirst, PhD, a flashbulb memory researcher at the New School for Social Research.

The idea of flashbulb memory was first proposed in 1977 by psychologists Roger Brown, PhD, and James Kulik, PhD, who posited that these memories are so emotionally important to us that they're laid down as vividly, completely and accurately as a photograph. But that idea remains hotly debated today. And each new public tragedy provides fodder for more research.

"Every time there's a public trauma, psychologists run out in the street and capture people's memories of what happened," says Hirst. "They did it with the Challenger explosion. They did it with the death of Princess Diana .... And we did it with 9/11."

Hirst, along with 15 other investigators across the country, runs the largest study of 9/11 memories. At least three smaller studies have also been published by memory researchers who, amidst their own shock and horror at the destruction of 9/11, knew that it presented a special research opportunity that other flashbulb situations hadn't: The attacks hit multiple communities and directly touched millions of Americans — forcing them to leave work early or race to retrieve their children from school. The media coverage was unending and there was a collective realization that life in America was forever changed.

I was in the World Trade Center Marriott on the 10th floor. I was at the window doing makeup when the windows shook. Then I saw all this gray confetti out the window, then a huge piece of white hot metal falling. I thought, "Bomb!" I grabbed a blouse, put on a jacket and was directed into the lobby of Tower 2 as I exited the hotel. There was acrid smoke and sirens. I passed a group of African-American women evacuating who were sobbing and comforting each other. I was in the underground mall when the second "bomb" went off. Most people were dashing toward the subway, but I saw an exit with daylight. Once outside, I realized I'd lost my cell phone. I tried to use the pay phones, but they weren't working. I saw an Asian man closing up his restaurant and signaled him that I needed something to drink. He opened the door, handed me water and a fresh roll. He wouldn't take any money. I followed the crowd across the Manhattan Bridge into Brooklyn. For some reason, I turned around as I was walking under the Brooklyn Bridge and saw the first tower slowly twist at the top and then collapse. I ran under the bridge, fearful that debris would come my way. Thankfully, it didn't. I was walking with a couple, and we stopped at a car wash and asked the owner, Mohammed, if we could rest there. He and his family let us use their phone without charge, and the three of us figured out how to get hold of people we knew. After that I sat down, finally broke down and sobbed. Mohammed provided much-needed tissues.

—ART TEACHER, MORGANTOWN, W.VA.

Now, 10 years later, the research findings are revealing a story that, like memory itself, is not exactly clear. Some of the 9/11 studies indicate that we forget or falsely remember much more than we realize; we get facts wrong, for example, or misremember our emotional reactions.

But some psychologists say more research is needed because these studies haven't done enough to consider the memory-making role of emotion or to distinguish flashbulb memories from regular memories. Certainly people *believe* they're more accurate and recall them more vividly. And there is mounting evidence that the closer we are physically and mentally to the event, the more we get it right, and the more we can recount every sight, sound and smell we experienced.

Opportunity — and guilt

Psychologist Jennifer Talarico, PhD, won't forget the moment she got the news. At the time a psychology doctoral student at Duke University, Talarico was making breakfast in her apartment when she heard a TV announcer say that a plane had struck the World Trade Center. Then she saw the second plane hit, and her mind turned to her work.

"I instantly thought this would be a tremendous opportunity for a flashbulb study," says Talarico, now an assistant professor of psychology at Lafayette College. "Then I felt terribly guilty for thinking about work at such a tragic time."

But the more she pondered it, the more she realized how much studying people's immediate reactions to the tragedy could advance the research on flashbulb memories.

At the time of 9/11, there was growing evidence of problems with Brown's and Kulik's theory, particularly the claims about accuracy. A number of studies had looked at how well people remembered the circumstances of such public events as the O.J. Simpson verdict, President Nixon's resignation and the Challenger explosion. Many of these studies indicated that, over time, people's memories of learning about the events — and of the events themselves — eroded, which challenges the contention that flashbulb memories are more accurate.

One of these studies, published in the book "Affect and Accuracy in Recall: Studies of 'Flashbulb' Memories'" (1992), had been widely cited for measuring flashbulb memory accuracy by comparing people's immediate recollections with later recollections. Two and a half years after the Challenger exploded, people's memories of the event and how they heard about it deteriorated significantly, found the study, led by Ulric Neisser, PhD, then at Emory University and now at Cornell.

But that research had several shortcomings, says Talarico. First, it only examined people's memories at two points, immediately afterward and much later, so it wasn't clear when or how their flashbulb memories declined. Second, it didn't compare people's flashbulb memories with regular

autobiographical memories to see if the decline was similar for both.

Talarico saw a chance to tackle these mysteries following the 9/11 attacks. She rushed to campus to find her mentor, longtime flashbulb memory researcher David Rubin, PhD, who agreed they should jump on the study. Fortuitously, the university's institutional review board was meeting down the hall and quickly approved the research.

Faulty flashbulbs?

The next day, the two researchers asked 54 Duke University students to recount their 9/11 memories. To get at the issue of what makes flashbulb memories unique, all the students answered questions about their memories of 9/11 and about a regular, everyday memory immediately after the event. One group of 18 students answered the same set of questions one week later; another group of 18 answered them six weeks later; and a different group of 18 answered them 32 weeks later.

Talarico and Rubin had the different groups recount their memories at these intervals to avoid an inadvertent "rehearsal effect," in which a memory gets strengthened through each retelling. Here's what they found: The consistency and accuracy of both 9/11 flashbulb memories and everyday memories declined over time, at comparable rates. But students *thought* something quite different was going on.

They believed that their 9/11 memories were much more accurate than their regular memories. One finding especially popped out for Rubin: People had already changed their stories of how they heard about the attacks over just a few days, from the day after the event to one week later. "Because at that point you've told 35 people how you heard about it, and it's been solidified in your memory the way you're telling it, not necessarily how it really happened," he explains.

And it isn't that people just make errors of omission and forget details, notes Talarico. "They make errors of commission as well, changing a red shirt to a blue one, or saying they were with different people from those they first said they were with."

Talarico and Rubin's findings square with results from the biggest 9/11 study done to date — the one led by Hirst of the New School for Social Research. In this seven-city investigation, 3,000 adults answered survey questions about their memories of learning about the attacks at three points in time: one week, 11 months and 35 months later. Hirst and his team looked at how people's flashbulb recollections, such as where and from whom they learned of the attacks, compared with their factual recollections, such as which airlines and how many airplanes were involved.

It turned out that the rate of forgetting for both types of memory slowed and stabilized after a year. But overall flashbulb recollections declined more than factual recollections, possibly because nonstop media coverage bolstered people's factual memories (see sidebar).

"What we're really looking at in flashbulb studies is consistency of people's stories, and we found a dramatic inconsistency in what people report after one week and after 36 months," Hirst says of the results, which were published in the *Journal of Experimental Psychology: General* (Vol. 138, No. 2). "People are changing who they were with, how they found out about the attacks, those sorts of aspects."

Forty percent of the time people misremember some aspect of their 9/11 experience, the study indicates. And the part they get the most wrong is how they felt.

> *My son was not quite four months old. I woke up first, around 7 a.m., and after warming up a bottle, I turned on the news. I believe the first tower had already collapsed. I called out to my girlfriend to come running. We sat glued to the television into the early afternoon. We shut the TV off and went for a very long walk around Mt. Tabor to try to make sense of what we had witnessed. I'll never forget the room, the bland low pile synthetic beige carpet, the boa constrictor 'Lowly' in his tank by the window, the dirty laundry strewn all over the floor.*
>
> **—GRAPHIC DESIGNER, PORTLAND, ORE.**

"You tend to project your current feelings about 9/11 on what you felt then," explains Hirst. "You see this in other aspects of daily life. For instance, if we ask college students how they feel about a boyfriend or girlfriend now, everything's good. But if you ask them about the person after they break up, they'll say they knew he or she was bad for them. Our emotions change over time, and it's hard to get back in that initial emotional space."

Etched by emotion

The Hirst, Talarico and Rubin findings seem to suggest that flashbulb memories are not necessarily all that accurate, but they do appear to be more vivid than other memories — at least people certainly perceive them that way. One researcher investigating why this is, and whether emotion plays a role, is Elizabeth Phelps, PhD, one of Hirst's collaborators on the seven-city study. A neuropsychologist based at New York University, Phelps wanted to see what happens in the brains of people most directly affected by 9/11 as they recall the experience. In a sample of New Yorkers, she sought to determine how proximity influenced memory.

In the study, published in the *Proceedings of the National Academy of Sciences* (Vol. 104, No. 1) and conducted in 2004, Phelps cued 24 participants to recall their 9/11 experiences and an unrelated, significant autobiographical memory from

The most beautiful September morning. I drove to the hardware store to buy bulbs. Coming out, I felt a boom and saw a large mushroom cloud. Going into the Starbucks, I heard the barista shouting. When I finally made sense of what he was saying, I knew what had happened. I moved the television to the back garden and started planting my bulbs. I was so tense I called the high school and told them to send my son home. We planted hundreds of bulbs in silence; only the television talked. When I picked up my other son from school, I was shaking as I greeted the school director. Without any spoken question, she looked at me and said, "All of our children are being picked up by the parents today." It was a long day. We were quiet. And, we never ate dinner.

—PROGRAM MANAGER, WASHINGTON, D.C.

earlier in the summer of 2001. She scanned their brains with functional magnetic resonance imaging as they retrieved the memories, then asked them questions about such flashbulb-like characteristics as memory vividness and emotional arousal.

A marked difference emerged between participants who were in downtown Manhattan, close to the towers, and those who were farther away, in midtown. All participants showed activity in the hippocampus — the brain area known for its involvement in day-to-day memory — when recalling the non-9/11 memory. The midtown participants also activated the hippocampus when recalling their 9/11 memory. But when downtown participants recalled the attacks, it lit up their amygdala — the brain area known for its role in making emotional memories.

"We know that the hippocampus is an important region for contextual memory, so it makes sense that it's used for recalling details of a neutral scene," says Phelps. Likewise, it makes sense that the amygdala plays a key part in forming emotionally charged flashbulb memories, she says. "The amygdala trains your attention on this emotionally arousing information to the exclusion of everything else around you," says Phelps. "And emotion, we know from previous research, helps you store memories. So that's how you get the flashbulb — the strong memory for a few, vivid details."

While the downtown participants reported vivid sights, smells and sounds, midtowners reported watching news coverage on television or the Internet, just like people in the rest of the country. Accuracy aside, this is where some other flashbulb studies have missed the mark — they haven't looked carefully enough at the important role of emotional arousal and at how many more vivid details people recall when high emotions are involved, says veteran memory researcher James McGaugh, PhD, founding director of the Center for the Neurobiology of Learning and Memory at the University of California–Irvine.

9/11: A media-shaped memory?

Americans, for the most part, quite clearly recall the facts of the 9/11 terrorist attacks, right down to how many planes were hijacked, where they hit and which airlines were involved. They remember much less about the 1986 explosion of the space shuttle Challenger. That's not just because it happened a longer time ago, says psychologist William Hirst, PhD, a memory researcher at the New School for Social Research.

In a Lexis Nexis analysis, Hirst found that major media outlets barely covered the Challenger compared with the barrels of ink and millions of pixels they've devoted to 9/11.

"To the extent that the media continues to talk about 9/11, the more our memories of the attacks are solidified," says Hirst. "We as a society came to believe that we have to talk about this all the time. We decided that this will be important, with an accompanying memory-strengthening effect."

Memory researcher David Rubin, PhD, agrees. Television images of the falling towers and smoking Pentagon were so compelling, he says, that it's common for people to mistakenly think they learned of the attacks on television, rather than from a friend. This pattern was first found in research by psychologists Ulric Neisser, PhD, and Nicole Harsch, PhD, published in the book "Affect and Accuracy in Recall: Studies of 'Flashbulb Memories'" (Cambridge University Press, 1992). Two years after the Challenger disaster, almost half of 42 Emory University students surveyed by the researchers claimed they'd learned of the incident on television. Only a fifth of them made that claim right after the explosion.

"Seeing it on TV is riveting and having a friend tell you about it is not riveting," explains Rubin. "You feel like a part of history saying you saw it live, when really it was the 16th replay."

—B. MURRAY LAW

McGaugh says neurobiological research from his and other labs shows that activating the amygdala with emotional stimuli correlates highly with subsequent memory of that stimuli. Because of this emotional component, flashbulb memory *is* more accurate than regular memory, he claims; it's just that studies to date haven't controlled comparisons of flashbulb and regular memories carefully enough.

"Just a tiny bit of emotional arousal will influence whether you remember something just a few minutes later," says McGaugh. And the more directly you're affected by something like 9/11 — the closer you are to it physically and emotionally — the more emotionally arousing, and better remembered, it will likely be, he says.

McGaugh points to a study led by Cornell's Neisser that looked at people's personal recollections regarding the 1989 Loma Prieta earthquake — what they were doing when they found out about it, for example. The study found that Californians directly jolted by the quake remembered their own experiences of it almost perfectly, much better than they remembered hearing about the Bay Bridge collapse. Atlantans, by comparison, had mostly forgotten how they heard about the event. But those Atlantans with relatives in the Loma Prieta area remembered learning of it much more clearly. The study results were published in 1996 in *Memory* (Vol. 4, No. 4).

In the same vein, and not surprisingly, the British remember close-to-home events, such as the death of Princess Diana and the resignation of Prime Minister Margaret Thatcher, much more clearly than Americans do, past research indicates.

But what couldn't be clearer for many Americans — whether recalled accurately or not — are the horrific events of 9/11. As the Phelps study indicates, those who saw it firsthand can recall it like it was yesterday, the images forever seared into their memories.

"I saw some scaffolding that I could go under to avoid the falling debris," said one participant in her study. "I saw with my own eyes: the towers burning in red flames, the noises and cries of people," reported another. For them, it is an instant frozen in time by emotional Instamatic. The focus preserved and unwavering. Much like a photograph.

Bridget Murray Law is a writer in Silver Spring, Md.

Further reading

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Psychologists' memories of 9/11

In the days and weeks following 9/11, psychologists in New York, Pennsylvania and Virginia provided comfort and support to victims' friends and families and to recovery workers. Go to www.apa.org/monitor/digital/911psychologists.aspx to watch three psychologists discuss their experiences:

• Margaret Pepe, PhD, who now manages military mental health services for the American Red Cross, was a disaster mental health officer there in 2001. A native Pennsylvanian, she was sent to the site of the Flight 93 crash in Shanksville, Pa., where she helped to coordinate a memorial service for victims' families.

• Daniel Dodgen, PhD, who works in disaster mental health for the U.S. Department of Health and Human Services, spent weeks volunteering at the Pentagon site. The experience helped convince him to work in disaster mental health full time.

• June Feder, PhD, a New York City private practitioner, was the New York State Disaster Response Network chair in 2001. She coordinated the hundreds of psychologists who volunteered in the aftermath of the attacks.