

Remember This

In the archives of the brain our lives linger or disappear.

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There is a 41-year-old woman, an administrative assistant from California known in the medical literature only as "AJ," who remembers almost every day of her life since age 11. There is an 85-year-old man, a retired lab technician called "EP," who remembers only his most recent thought. She might have the best memory in the world. He could very well have the worst.

"My memory flows like a movie—nonstop and uncontrollable," says AJ. She remembers that at 12:34 p.m. on Sunday, August 3, 1986, a young man she had a crush on called her on the telephone. She remembers what happened on *Murphy Brown* on December 12, 1988. And she remembers that on March 28, 1992, she had lunch with her father at the Beverly Hills Hotel. She remembers world events and trips to the grocery store, the weather and her emotions. Virtually every day is there. She's not easily stumped.

There have been a handful of people over the years with uncommonly good memories. Kim Peek, the 56-year-old savant who inspired the movie *Rain Man*, is said to have memorized nearly 12,000 books (he reads a page in 8 to 10 seconds). "S," a Russian journalist studied for three decades by the Russian neuropsychologist Alexander Luria, could remember impossibly long strings of words, numbers, and nonsense syllables years after he'd first heard them. But AJ is unique. Her extraordinary memory is not for facts or figures, but for her own life. Indeed, her inexhaustible memory for autobiographical details is so unprecedented and so poorly understood that James McGaugh, Elizabeth Parker, and Larry Cahill, the neuroscientists at the University of California, Irvine who have been studying her for the past seven years, had to coin a new medical term to describe her condition: hyperthymestic syndrome.

EP is six-foot-two (1.9 meters), with perfectly parted white hair and unusually long ears. He's personable, friendly, gracious. He laughs a lot. He seems at first like your average genial grandfather. But 15 years ago, the herpes simplex virus chewed its way through his brain, coring it like an apple. By the time the virus had run its course, two walnut-size chunks of brain matter in the medial temporal lobes had disappeared, and with them most of EP's memory.

The virus struck with freakish precision. The medial temporal lobes—there's one on each side of the brain—include an arch-shaped structure called the hippocampus and several adjacent regions that together perform the magical feat of turning our perceptions into long-term memories. The memories aren't actually stored in the hippocampus—they reside elsewhere, in the brain's corrugated outer layers, the neocortex—but the hippocampal area is the part of the brain that makes them stick. EP's hippocampus was destroyed, and without it he is like a camcorder without a working tape head. He sees, but he doesn't record.

EP has two types of amnesia—anterograde, which means he can't form new memories, and retrograde, which means he can't remember old memories either, at least not since 1960. His childhood, his service in the merchant marine, World War II—all that is perfectly vivid. But as far as he knows, gas costs less than a dollar a gallon, and the moon landing never happened.

AJ and EP are extremes on the spectrum of human memory. And their cases say more than any brain scan about the extent to which our memories make us who we are. Though the rest of us are somewhere between those two poles of remembering everything and nothing, we've all experienced some small taste of the promise of AJ and dreaded the fate of EP. Those three pounds or so of wrinkled flesh balanced atop our spines can retain the most trivial details about childhood experiences for a lifetime but often can't hold on to even the most important telephone number for just two minutes. Memory is strange like that.

What is a memory? The best that neuroscientists can do for the moment is this: A memory is a stored pattern of connections between neurons in the brain. There are about a hundred billion of those neurons, each of which can make perhaps 5,000 to 10,000 synaptic connections with other neurons, which makes a total of about five hundred trillion to a thousand trillion synapses in the average adult brain. By comparison there are only about 32 trillion bytes of information in the entire Library of Congress's print collection. Every sensation we remember, every thought we think, alters the connections within that vast network. Synapses are strengthened or weakened or formed anew. Our physical substance changes. Indeed, it is always changing, every moment, even as we sleep.