

FORGET YOUR WORRIES

THE SOURCE: “Repairing Bad Memories” by Stephen S. Hall, in *MIT Technology Review*, July/August 2013.

PICTURE A FAT, HAIRY TARANTULA. IF YOU’RE among the millions who suffer arachnophobia, even imagining an eight-legged monster can conjure up intense feelings of fear and anxiety, deeply rooted in bad memories.

Daniela Schiller, a neuroscientist at Mount Sinai Hospital in New York City, thinks she can help. As science writer Stephen S. Hall reports in the *MIT Technology Review*, Schiller’s work has turned the conventional wisdom on its head, showing that human memories are by no means immutable. Rather, Hall explains, they’re “malleable constructs that may be rebuilt every time they are recalled”—so malleable that our most traumatic memories could possibly be reconfigured to cause us less stress.

For most of the 20th century, scholars envisioned a memory as a permanent imprint on the brain that strengthened with time. That view, known as “consolidation theory,” held that any memory act—recalling a friend’s birthday, remembering how to drive, or shuddering at the thought of a spider—amounted

to simply retrieving a certain file from a mental filing cabinet.

Consolidation theory started to break down with the revelation that memory could be manipulated under the right conditions, beginning with an experiment at Rutgers University in 1968. Researchers conditioned lab rats to expect a small electrical jolt whenever they licked water from a drinking tube after hearing white noise. Immediately after this conditioning, some of the rats received a stronger electroconvulsive shock to the head. The next day, most of the rats were still hesitant to drink when they heard the white noise, lest they invite another jolt—but the group that had received the second zap lapped up water eagerly, their fears erased.

In 2000, New York University psychologists managed to clear rats’ memories with pharmaceutical help. Having also trained rats to expect a shock after hearing a particular sound, they injected a drug straight into each animal’s amygdala, the part of the brain thought to harbor fear memories. Upon receiving the drug, which stopped the brain from synthesizing proteins, the rodents no longer froze in terror at the sound. The implication was huge: In rats, at least, memories could be amended, or “reconsolidated.”

Was the same true for humans? Schiller and her colleagues at NYU designed an experiment to find out. Volunteers were shown a computer screen featuring a blue square, then given a small but unpleasant shock. That procedure was repeated until the subjects firmly expected to be zapped whenever they saw the blue square. This new memory was given time to solidify—10 minutes for some volunteers, six hours for others. The subjects were then shown the blue box again, but this time, in an attempt to modify the memory, they weren't shocked afterward.

For the 10-minute group, the treatment worked. Breaking the connection between the blue box and the shock rewrote their memories so that they stopped reacting to the box. But the treatment failed for the group that went six hours before receiving it; their memories had become embedded. Schiller and her colleagues published their results in

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Nature in 2010. “By mastering the timing,” explains Hall, “the NYU group had essentially created a scenario in which humans could rewrite a fearsome memory and give it an unafrightening ending.”

This finding has spurred research into drug-free treatments for a host of memory-related conditions. Researchers in Beijing have used it to help heroin addicts alter their reactions to environmental stimuli that trigger cravings. Schilling herself is now trying to help people afflicted with arachnophobia, overhauling their neural responses as they stare at a live tarantula.

Her lab is also investigating how memory therapy could benefit from beta-blockers, drugs that are usually used in treating heart conditions. Her team is hopeful that new pharmaceutical treatments will lengthen the period in which a memory can be rewritten. If they're right, it could be a boon for patients with ills such as posttraumatic stress disorder, allowing them to be treated as they summon traumatic memories.

Schiller's work could bring about not only a new era of psychological research, but a complete shift in how we understand history. “Every memoir is fabricated,” Hall marvels, “and the past is nothing more than our last retelling of it.” ■