
SCIENCE & TECHNOLOGY

The Anatomy Of Memory

"Remembrance of Things Partly" by Wray Herbert, in *Science News* (Dec. 10, 1983), 231 West Center St., Marion, Ohio 43302.

"H.M.," as he is known to scientists, underwent surgery in 1953 in which much of the hippocampus region of his lower brain was removed to stop his epileptic seizures. In a freak accident with a fencing foil in 1960, another man, "N.A.," suffered an injury to the left side of his thalamus, in the middle of his brain. The result for both men: amnesia.

But different kinds of amnesia. Because of those differences, writes Herbert, a *Science News* editor, the unique cases of H.M. and N.A. are keys to scientific studies of how human memory works.

For example, although both men can remember events that took place *before* amnesia struck, H.M. is unable to recall some things that happened just a few years before his surgery. When a McGill University researcher tested the memories of patients who had undergone electroconvulsive therapy (which also disrupts the hippocampus), she found that, like H.M., they had lost memories of events a few years prior to their treatment. The hippocampus, she suggests, is responsible for consolidating memories, a process that seems to take several years.

Other research indicates that there are perhaps dozens of memory "circuits" in the brain, each responsible for transmitting different aspects—texture, color, emotion—of the same experience. Herbert cites the unusual case of a woman who had "lost all memories of former acquaintances, but continued to respond with appropriate emotions to those she had liked and those she had not."

Their impaired memories make learning new things hard for H.M. and N.A. But both are capable of certain kinds of learning. H.M., who is able to recall next to nothing that has occurred since 1953, has nevertheless acquired new motor, perceptual, and other skills (such as puzzle solving).

Does the brain, then, make "a fundamental distinction between knowledge and skill"? Such a finding would be "stunning," reports Herbert. For years, cognitive psychologists have argued that behavior is the result of applying knowledge; behaviorists, that it is a product of conditioned responses. If a knowledge-skill distinction exists in the brain, both would be right. Conditioned responses (skills) would be the responsibility of one part of the brain, learned behavior of another. That might explain why babies are capable of some learning but as adults retain no memories of their infancy—the "habit" system of the brain develops faster than the intellectual "memory" system.

Such research, however, means little to N.A. and H.M. Amnesia is not susceptible to a knock-on-the-head cure, as it is in the movies. Even for the less seriously impaired N.A., writes Herbert, returning to his home is like "finding his way around a town he hasn't been to in 20 years."