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George A. Miller, a Pioneer in Cognitive Psychology, Is Dead at 92

By PAUL VITELLO

Psychological research was in a kind of rut in 1955 when George A. Miller, a professor at Harvard, delivered a paper titled “The Magical Number Seven, Plus or Minus Two,” which helped set off an explosion of new thinking about thinking and opened a new field of research known as cognitive psychology.

The dominant form of psychological study at the time, behaviorism, had rejected Freud’s theories of “the mind” as too intangible, untestable and vaguely mystical. Its researchers instead studied behavior in laboratories, observing and recording test subjects’ responses to carefully administered stimuli. Mainly, they studied rats.

Dr. Miller, who died on July 22 at his home in Plainsboro, N.J., at the age of 92, revolutionized the world of psychology by showing in his paper that the human mind, though invisible, could also be observed and tested in the lab.

“George Miller, more than anyone else, deserves credit for the existence of the modern science of mind,” the Harvard psychologist and author Steven Pinker said in an interview. “He was certainly among the most influential experimental psychologists of the 20th century.”

Dr. Miller borrowed a testing model from the emerging science of computer programming in the early 1950s to show that humans’ short-term memory, when encountering the unfamiliar, could absorb roughly seven new things at a time.

When asked to repeat a random list of letters, words or numbers, he wrote, people got stuck “somewhere in the neighborhood of seven.”

Some people could recall nine items on the list, some fewer than seven. But regardless of the things being recalled — colors and tastes, numbers with decimals, numbers without decimals, consonants, vowels — seven was the statistical average for short-term storage. (Long-term memory, which followed another cognitive formula, was virtually unlimited.)

Dr. Miller could not say why it was seven. He speculated that survival might have favored early humans who could retain “a little information about a lot of things” rather than “a lot of information about a small segment of the environment.”

But that, he concluded, was beside the point. He had articulated an idea that was to become a touchstone of cognitive science: that whatever else the brain might be, it was an information processor, with systems that obeyed mathematical rules, that could be studied.

Dr. Miller, who was trained in behaviorism, was among the first of many researchers and theorists to challenge its scientific principles in the 1950s. He and a colleague, Jerome S. Bruner, gave a name to the new research field when they established a psychology lab of their own, the Center for Cognitive Studies, at Harvard in 1960. Just by employing the word “cognitive,” considered taboo among behaviorists, they signaled a break with the old school.

“Using ‘cognitive’ was an act of defiance,” Dr. Miller wrote in 2006. “For someone raised to respect reductionist science, ‘cognitive psychology’ made a definite statement. It meant that I was interested in the mind.”

That new approach to psychological research came to be known as the cognitive revolution.

Dr. Miller’s first and most enduring interest as a scientist was language. His first book, “Language and Communication” (1951), is widely considered a foundational work in psycholinguistics, the study of how people learn, use and invent language. He collaborated with the linguist Noam Chomsky in groundbreaking papers on the mathematics of language and the computational problems involved in interpreting syntax.

He conducted some of the first experiments on how people understand words and sentences, the basis of computer speech-recognition technology. “Plans and the Structure of Behavior” (1960), written with Eugene Galanter and Karl H. Pribram, was an effort to synthesize artificial-intelligence research with psychological research on how humans initiate action — basically, a book about how to build a better robot. Beginning in 1986, he oversaw the development of WordNet, an electronic reference databank intended to help computers understand human language.

Colleagues said he had a role in framing many of his era’s most audacious thoughts about human and artificial thinking; typically, he then moved on to other projects.

“Like most great scientists, he became interested in some phenomenon or other and then simply jumped in to try to illuminate the problem,” said Michael S. Gazzaniga, a leading researcher in cognitive neuroscience at the University of California, Santa Barbara. Dr. Miller helped create the field of cognitive neuroscience in the late 1980s, he said. “He was exceptionally generous.”

George Armitage Miller was born on Feb. 3, 1920, in Charleston, W.Va., the only child of Florence and George Miller, who divorced when he was a child. His father was a steel company executive.

Mr. Miller and his first wife, Katherine, who died in 1996, married while both were undergraduates

at the University of Alabama. After graduating with a bachelor's degree in English and speech, Mr. Miller received his master's degree and Ph.D. in psychology at Harvard, serving in the Army Signal Corps during World War II in between.

He taught at Harvard beginning in 1955, heading its psychology department from 1964 until 1967, and later taught at Rockefeller University in New York and at the Massachusetts Institute of Technology. He joined the faculty of Princeton in 1979, founded the Cognitive Science Laboratory there and became a professor emeritus in 1990.

His survivors include his wife, Margaret, whom he married in 2008; a son, Donnally; a daughter, Nancy Saunders; and three grandchildren.

Dr. Miller's paper on the number seven, which he read on April 5, 1955, at a meeting of the Eastern Psychological Association in Philadelphia, opened with a memorable line: "My problem is that I have been persecuted by an integer."

He went on to make a topical reference to the Communist scare of the McCarthy era: "The persistence with which this number plagues me is far more than a random accident. There is, to quote a famous senator, a design behind it."

The paper's ground-shifting implications made it one of the most frequently quoted texts in the canon of modern psychology (and by Dr. Miller's account, one of the most misquoted). For better or worse, "The Magical Number Seven" came to haunt his scientific career, overshadowing his many other accomplishments.

It resonated more playfully in his golf game. "He made the one and only hole-in-one of his life at the age of 77, on the seventh green" at the Springdale Golf Club in Princeton, his daughter said. "He made it with a seven iron. He loved that."

This article has been revised to reflect the following correction:

Correction: August 3, 2012

Because of an editing error, a picture caption on Thursday with an obituary about Dr. George A. Miller, a pioneer in cognitive psychology, misstated his profession. He was a psychologist, not a psychiatrist.

This article has been revised to reflect the following correction:

Correction: September 13, 2012

An obituary on Aug. 2 about the cognitive psychologist George A. Miller described incorrectly an experiment he conducted in the 1950s involving short-term memory. Among the items of which participants were asked to recall random lists were colors and tastes, not "color words" and "food words." (A reader pointed out the error in an e-mail when the obituary was published; this correction

was delayed for research.)