

How memories are made, and recalled

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What makes a memory? Single cells in the brain, for one thing. For the first time, scientists at UCLA and the Weizmann Institute of Science in Israel have recorded individual brain cells in the act of calling up a memory, thus revealing where in the brain a specific memory is stored, and how it is able to recreate it.

Reporting in the current edition of the journal *Science*, Dr. Itzhak Fried, senior author and a UCLA professor of neurosurgery, and colleagues, recorded the activity of hundreds of individual neurons making memories from the brains of 13 epilepsy patients being treated at the UCLA Medical Center. The patients' surgeons had placed electrodes into their brains to locate the origin of their seizures before surgical treatment (standard procedure in such cases).

Fried made use of the same electrodes to record neuron activity as memories were being formed. The patients watched several video clips of short duration—including such things as landmarks and people, along with other clips of Homer Simpson, Jerry Seinfeld, Tom Cruise and others. As the patients watched, the researchers recorded the activity of many neurons in the hippocampus and a nearby region called the entorhinal cortex, that responded strongly to individual clips. A few minutes later, after performing an intervening task, the patients were asked to recall whatever clips came to mind.

"They were not prompted to recall any specific clips," said Fried, "but to use 'free recall,' that is, whatever popped into their heads." The researchers found that the same neurons that had responded earlier to a

specific clip fired strongly a second or two before the subject reported what he had recalled (but did not fire when other clips were recalled). Ultimately, it was possible for the researchers to know what clips the patients recalled before they even said it.

Fried notes the single neurons that were recorded as they fired were not acting alone, but were part of a much larger memory circuit of hundreds of thousands of cells caught in the act of responding to the clips. The study is significant, he said, because for the first time it confirms that spontaneous memories arise with activity of the very same neurons that were recorded as they fired when the memory was first being made. This link between reactivation of neurons in the hippocampus with conscious recall of past experience has been suspected and theorized for sometime, but the study now provides direct evidence for such link. "In a way then, said Fried, "reliving past experience in our memory is the resurrection of neuronal activity from the past"

Source: University of California - Los Angeles

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