

Memories: It's all in the packaging, scientists say

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Researchers at UC Irvine have found that how much detail one remembers of an event depends on whether a certain portion of the brain is activated to “package” the memory.

The research may help to explain why sometimes people only recall parts of an experience such as a car accident, and yet vividly recall all of the details of a similar experience.

In experiments using functional magnetic resonance imaging (fMRI), the scientists were able to view what happened in the brains of subjects when they experienced an event made up of multiple contextual details. They found that participants who later remembered all aspects of the experience, including the details, used a particular part of the brain that bound the different details together as a package at the time the event occurred. When this brain region wasn't activated to bind together the details, only some aspects of an event were recalled. The findings appear in the current issue of *Neuron*.

“This study provides a neurological basis for what psychologists have been telling us for years,” said Michael Rugg, director of UCI's Center for the Neurobiology of Learning and Memory and senior author of the paper. “You can't get out of memory what you didn't put into it. It is not possible to remember things later if you didn't pay attention to them in the first place.”

The scientists presented 23 research subjects with a list of words while

they underwent an fMRI scan. The words were in different colors and would appear in one of four quadrants on a screen. The subjects had to decide whether the words represented an animate or inanimate object. Later, the participants were presented the words again, interspersed with words they had not seen before, and asked if they remembered seeing those words before. They were also asked if they remembered in what color the word had originally been and in which of the four quadrants it had originally appeared.

If the participant could later remember the color of the word, a particular area of the brain associated with color processing was especially active during learning. If the subject later remembered the location of the word, activity was seen in an area associated with spatial processing. But if the subject remembered the word, the color and the location, then another critical brain region became involved. The researchers observed enhanced activity in the intra-parietal sulcus, a part of the parietal cortex. It appears that this region is responsible for binding together all the features of a particular memory so that contextual details, as well as more central aspects of the event such as the identity of the word, can later be recalled.

“We know that if the intra-parietal sulcus is damaged, then someone cannot attend to multiple aspects of the same object, such as its size and color,” said Melina Uncapher, a graduate student researcher and lead author of the study. “This study provides empirical evidence for how critical this region is for bringing the constituents of a memory together in the brain.

“Memory is more than a sum of its parts. A complete memory of an event requires that the features of the event be brought together and processed by the brain as a common perceptual representation, before being stored.”

Source: University of California, Irvine

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