

Where life's memories are stored

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By studying in detail the ability of patients with selective brain damage to recall events in their past, researchers, led by Larry R. Squire of the University of California San Diego and Veterans Affairs Medical Center, have helped settle a long-standing controversy about where the long-term memory of one's personal experiences are stored. The research is published in the June 2 issue of *Neuron*.

The controversy has revolved around whether long-term memory continues to depend on the region called the medial temporal lobe, which contains the brain's memory-processing center, the hippocampus. According to this view, such "autobiographical" memories depend on specific contextual information that would require the continued involvement of the brain's central memory structures.

The other view is that autobiographical memories, like other types of shorter-term memories, gradually become independent of the medial temporal lobe as time passes.

Memory studies of brain-damaged patients have not yielded a clear winner, because of the complexity of such damage and the difficulty in accurately documenting the quality of such memories.

Now, Squire and his colleagues have presented evidence that "the ability to recollect remote autobiographical events depends not on the medial temporal lobe but on widely distributed neocortical areas."

In their experiments, Squire and his colleagues studied patients with

damage limited to the medial temporal lobe as well as those with broader damage to the neocortex. The damage was due to such problems as ischemia due to drug overdose, brain aneurysm, or encephalitis.

They triggered patients' long-term memories by presenting them with "cue" words such as "river," "bottle," and "nail." The scientists asked the patients to recall events in their lives associated with those words. They then asked the patients to rate the quality of those memories.

Specifically, they asked the patients to distinguish "remembering" the event versus "knowing" the event. "Remembering" meant that the patients could place themselves in the event, while "knowing" meant that they knew it happened to them, but could not "travel back in time" to reexperience the event. The researchers also asked the patients to score the vividness of the recalled imagery and whether they recalled the event from the first-person perspective. They compared the performance of the patients to that of a normal control group.

"There were two major findings," reported the researchers. "First, the patients with damage restricted mainly to the medial temporal lobe performed normally on tests of remote autobiographical memory, whereas the patients with significant damage to the neocortex were severely impaired.

"Second, by three measures—the subjective experience of remote autobiographical recollection was normal in the five patients with damage restricted mainly to the medial temporal lobe.

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