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Amnesiacs May Be Cut Off From Past and Future Alike

By [BENEDICT CAREY](#)

In the movies amnesia is bizarre, and thrilling. The star is usually a former assassin or government agent whose future depends on retrieving the bloody, jigsaw fragments that restore identity and explain the past.

Yet in the real world, people with amnesia live in a mental universe at least as strange as fiction: new research suggests that they are marooned in the present, as helpless at imagining future experiences as they are at retrieving old ones.

The new [study](#), reported last week in The [Proceedings of the National Academy of Sciences](#), is the first rigorous test of how brain-injured people with amnesia mentally inhabit imaginary scenes. The results suggest that to the brain, remembered experience and imagined experience are reflections from the same mirror, rich inner worlds animated by almost identical neural networks.

The findings provide a glimpse into what it might mean to truly live in the moment. And they feed a continuing debate about memory. Some researchers say that the brain region central to forming new memories — the hippocampus, a sliver of tissue deep in the brain where the day's memories are registered — is not necessary for retrieving those experiences, once they have been consolidated elsewhere in the brain.

Others, including the authors of the new study, contend that the hippocampus in fact provides the stage on which inner mental dramas are set. Without its help only the props remain — loose facts, people's names, snippets from favorite songs: the players without the play.

“The study suggests that these patients have fragments, the brick and mortar to create new scenarios, but their descriptions lack coherence because they don’t have the scaffolding the hippocampus provides,” said Morris Moscovitch, a neuroscientist at the University of Toronto, who was not involved in the study. “The other interpretation is they don’t have enough brick and mortar to put it all together.”

The researchers, led by Eleanor Maguire and Demis Hassabis of University College London, instructed five men with severe hippocampus injuries to imagine themselves in familiar scenes, like a museum, a pub and a beach. People with this type of injury, often from oxygen deprivation due to a heart attack, can seem in conversation to be as mentally adept as the next person — until it becomes clear they have forgotten comments made only moments before.

The men, urged to fill out the scenes with imagined detail, described what they could. The researchers analyzed transcripts of their answers, carefully scoring each one for personal touches: projected emotions, sensations and actions. They found that compared with similar descriptions produced by adults without brain injuries, the five men’s imagined scenes were flat, barren of personal dimension.

“We think that what the hippocampus provides is a scaffold for experience and imagination, and that scaffold is spatial,” Dr. Maguire said. The brain’s record of physical space, she said, appears to be necessary to infuse a scene with rich personal dimension.

Other researchers said the dulling of imagination could reflect a more fundamental dynamic. The brain may naturally draw on previous experiences to inform imaginary scenes, said Peter J. Bayley, a neuroscientist at the [University of California](#), San Diego. If so, the only such memories accessible to the men might have been childhood scenes, consolidated over the years outside the hippocampus, which would not likely provide rich detail to outfit, say, an imaginary pub.

“The differences between the two groups may reflect the difficulty the patients are having retrieving information from the recent past,” Dr.

Bayley said. He and other researchers have previously reported on patients with hippocampus damage who can recall childhood memories in the same kind of detail almost everyone else does.

The distinctions the brain makes between loose facts and the richer, wraparound ambience of an experience are important to understanding memory, because people with healthy brain function tend to recall the gist of experience, whereas those with hippocampus damage can often recollect discrete facts with more accuracy. The difference is partly reflected in the study participants' words.

When asked to envision an open-air market, one brain-injured man said: "I see people, very many people. Most of all ... um ... not many men, all I see are young ladies. And basically they are all in a hurry."

A participant without brain injury responded: "Right, so on either side of me I've got stalls and it's noisy. We have a person on my right who is selling fruit and veg, and they're telling us that bananas are on special offer this week, and they're shouting about that."

In an essay published this month in the journal *Nature*, two [Harvard](#) researchers, Daniel L. Schacter and Donna Rose Addis, contend that this ability to richly imagine scenes, whether entirely dependent on the hippocampus or not, is perhaps the most promising frontier for memory research.

"For almost 100 years, memory has been the object of experimental studies that have focused almost exclusively on its role in preserving and recovering the past," they wrote. "We think it's time to try to understand some of memory's errors by looking to the future."

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