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Where Memories Are Made

A new study has confirmed one long-standing hypothesis in neuroscience--the idea that sensory-specific areas of your brain are reactivated when you remember a sight or sound. That part of the finding was expected. But what is surprising, the researchers say, is that only the highest-level areas involved in perception come back into play on reflection. Their work appears in today's issue of *Proceedings of the National Academy of Sciences*.

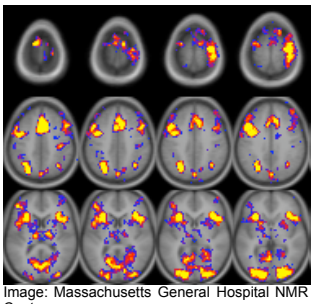
Image: Massachusetts General Hospital NMR Center

Howard Hughes Medical Institute investigator Randy L. Buckner and colleagues Mark E. Wheeler and Steven E. Petersen of Washington University in St. Louis used functional MRI (fMRI), which produces images (such as the ones shown at the right) that reveal blood flow changes in the brain, to test the reactivation hypothesis. "We thought that fMRI, with its ability to see changes in brain activity on a moment-to-moment basis, would give us a prime opportunity to gain new insight into this fundamental question."

They presented subjects with pictures of ordinary objects, such as a dog and a plane, as well as with sounds such as barking and engine roaring. Then they put the participants in an MRI scanner and prompted them to remember the sights and sounds they experienced earlier using labels. The results invariably showed reactiviation in either the visual or auditory cortex, depending on the memory. "Perhaps we were seeing memory's echo in the brain--activity associated with the stored memory that momentarily bounces back to our awareness when we attempt to remember," Buckner comments.

Of interest, the neural areas reactivated during memory represent only a subset of those regions at work during an original experience. "While we need to do more work to understand this discovery," Buckner notes, "it suggests that during remembering, the brain areas reactivated do not include those involved with the earliest levels of perception, but rather selectively rely on high-level brain areas that already contain rather complex representations of sensory information." Figuring out these representations in the future, he adds, may lead to ways of helping patients with memory impairments.