Neurobiologists uncover evidence of a 'memory code'

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By examining how sounds are registered during the process of learning, UC Irvine neurobiologists have discovered a neural coding mechanism that the brain relies upon to register the intensity of memories based on the importance of the experience.

While neurobiologists have long hypothesized this type of neural coding, the study presents the first evidence that a "memory code" of any kind may exist. The UCI researchers believe that this code, as well as similar codes that may be discovered, will not only broaden our understanding of normal learning and memory but also may shed light on learning disorders. It may also one day be possible to manipulate these codes to control what and how we remember – not only basic sounds, but complicated information and events.

"This memory code may help explain both good and poor memory," said Norman Weinberger, a professor of neurobiology and behavior in UCI's Center for the Neurobiology of Learning and Memory. "People tend to remember important experiences better than routine ones."

Weinberger and his colleagues found that when the brain uses this coding method, information is stored in a greater number of brain cells, which should result in a stronger memory. However, the researchers believe that if the brain fails to use the code, the resulting memory – even if it is an important one – would be weaker because fewer neurons would be involved.

Weinberger and postdoctoral researcher Richard Rutkowski discovered this coding system through studying how the primary auditory cortex responds to various sounds.

In the study, the researchers trained rats to press a bar to receive water when they heard a certain tone. The tone was varied in its importance to different rats as shown by their different levels of correct performance.

After brain mapping these test rats, the researchers found that the greater the importance of the tone, the greater the area of the auditory cortex that became tuned to it. The results in rats that received the same tones but were trained to a visual stimulus did not differ from those in untrained rats, showing that the behavioral importance of the tone, not its mere presence, was the critical factor.

Study results appear on the Online Early Edition of the Proceedings of the National Academy of Sciences. The National Institute on Deafness and Other Communication Disorders supported the effort.

Source: University of California, Irvine