

Memory is Stored by Turning on Genes in Neurons (to Alter Connection Between Neurons)(3)

Curious Cat Science and Engineering Blog

I find these kind of stories so interesting. I really have so little understanding of genes. I knew memory had something to do with altering connections between neurons. I had no idea that required turning on many genes in those neurons. Life really is amazing.

[Neuroscientists identify a master controller of memory](#) [1]

When you experience a new event, your brain encodes a memory of it by altering the connections between neurons. This requires turning on many genes in those neurons.

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Lin and her colleagues found that Npas4 turns on a series of other genes that modify the brain's internal wiring by adjusting the strength of synapses, or connections between neurons. This is a gene that can connect from experience to the eventual changing of the circuit, says [\[Yingxi\] Lin](#) [2]

So far, the researchers have identified only a few of the genes regulated by Npas4, but they suspect there could be hundreds more. Npas4 is a transcription factor, meaning it controls the copying of other genes into messenger RNA, the genetic material that carries protein-building instructions from the nucleus to the rest of the cell. The MIT experiments showed that Npas4 binds to the activation sites of specific genes and directs an enzyme called RNA polymerase II to start copying them.

Npas4 is providing this instructive signal, Ramamoorthi says. It's telling the polymerase to land at certain genes, and without it, the polymerase doesn't know where to go. It's just floating around in the nucleus.

When the researchers knocked out the gene for Npas4, they found that mice could not remember their fearful conditioning. They also found that this effect could be produced by knocking out the gene just in the CA3 region of the hippocampus. Knocking it out in other parts of the hippocampus, however, had no effect.

One of the things I aim to do in 2012 is read a few more books on biology and genes. I find it incredible what genes actually are doing to allow us to live our lives. And I am also very ignorant on the whole area. So hopefully I can have some fun next year learning about it.

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[1] <http://www.mit.edu/newsoffice/2011/hippocampus-memory-genes-1222.html>

[2] <http://mcgovern.mit.edu/principal-investigators/yingxi-lin>

[3] <http://engineering.curiouscatblog.net/2011/10/26/epigenetic-effects-on-dna-from-living-conditions-in-childhood-persist-well-into-middle-age/>

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