Brain-Like Computer Closer to Realization

March 17 2010, by Miranda Marquit

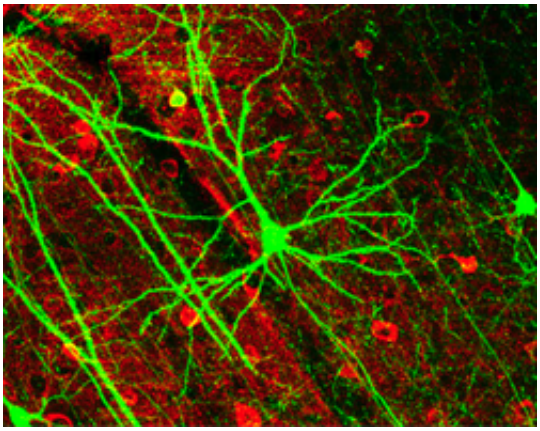


Image: PLoS Biology via Wikipedia

(PhysOrg.com) -- Almost since computing began, scientists and technologists have been fascinated with the idea of a computer that works similarly to the human brain. In 2008, the first "memristor" was built, a device that is designed to behave in a manner that mimics the junctions betweens the neurons in the brain. However, until recently, the memristor was just a device. Now a group at the University of Michigan, led by Wei Lu, has demonstrated that the memristor can actually be used in computing. Their findings were published in Nano Letters: "Nanoscale Memristor Device as Synapse in Neuromorphic Systems."

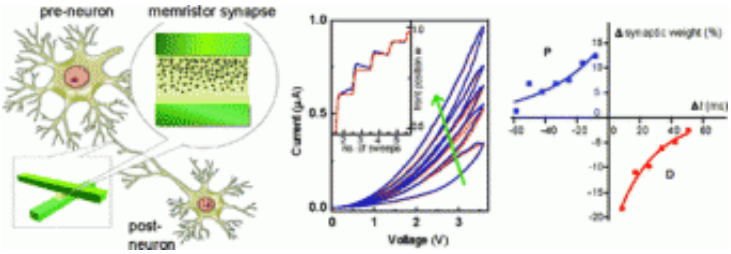
The Michigan team used the same sorts of materials that we have readily available when building computer chips: silicon and silver. The team joined two metal electrodes at their crossing using the silicon and silver

mixture in order to reflect behavior of the synapses in the brain. This set-up is believed to provide a way to store memories as the memristor learns new firing patterns. New Scientist reports on the importance of this computing memristor:

In the brain the timing of electrical signals in two neurons affects the ease with which later messages can jump across the synapse between them. If the pair fire in close succession, the synapse becomes more likely to pass subsequent messages between the two. "Cells that fire together, wire together," says Lu.

The Michigan device exhibits the same behaviour. When the gap between signals on the two electrodes was 20 milliseconds, the resistance to current flowing between the two was roughly half that after signals separated by 40 milliseconds. "The memristor mimics synaptic action," says Lu, adding that the next step will be to build circuits with tens of thousands of memristor synapses.

However, it has yet to be proved that memories are being stored by this set-up, and stored information hasn't been retrieved. But the fact that a team of scientists has managed to create a situation in which the brain is mimicked by human-developed technology means that a brain-like computer could be closer to realization.



A memristor is a two-terminal electronic device whose conductance can be precisely modulated by charge or flux through it. Image credit: Nano Letters, DOI:10.1021/nl904092h

More information: *Paul Marks, "Electronics 'missing link' brings neural computing closer," New Scientist (2010). Available online: www.newscientist.com/article/m … omputing-closer.html .
*Sung Hyun Jo, et. al., "Nanoscale Memristor Device as Synapse in Neuromorphic Systems," Nano Letters (2010). Available online: pubs.acs.org/doi/abs/10.1021/nl904092h .