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Nanomechanical Memory Demoed

November 23, 2004

A bit -- the basic unit of computer information -- can be made from anything that can be switched between two states, which represent 1 and 0.

Computer chips use the presence and absence of electric current to represent 1 and 0; disk drives use positive and negative magnetic poles. Early precursors to today's computers used mechanical rather than electrical elements to store and process data.

The rise of nanotechnology has led many researchers to revisit mechanical computing. Nanotechnology has yielded microscopic materials that range from thousandths of a millimeter -- around cell size -- to millionths of a millimeter -- the realm of molecules.

Boston University researchers have made a minuscule mechanical memory cell from silicon. The memory device is a microscopic beam that, when compressed at both ends, buckles to one side or the other. The memory uses the two buckling directions to represent 1 and 0.

The memory cell beam is 8,000 nanometers long by 300 nanometers wide by 200 nanometers high and flexes when current is sent through it.

It can be switched between flexed states 23.5 million times per second, or megahertz. Today's state-of-the-art memory chips operate at 400 megahertz. Shortening the beam to 1,000 nanometers will increase its frequency to more than a billion times per second, or gigahertz.

The memory cell could be made by the millions using standard chipmaking techniques, could hold than 100 gigabytes per square inch, and uses several orders of magnitude less power than today's electronic memory, according to the researchers. Mechanical memory is also resistant to the radiation and electromagnetic pulses that can disrupt electronic and magnetic devices.

The memory could be used practically in two to five years, according to the researchers. The work appeared in the October 18, 2004 issue of *Applied Physics Letters*.

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