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A MOLECULAR SHIFT REGISTER MEMORY BASED ON ELECTRON TRANSFER*

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An electronic shift register memory at the molecular level is described. The memory elements are based on a chain of electron transfer molecules and the information is shifted by photoinduced electron transfer reactions. This device integrates designed electronic molecules onto a very lage scale integrated (silicon microelectronic) substrate, providing an example of a "molecular electronic device" which could actually be made.

Electron transfer reactions are desirable for this device because they involve no bond formation or breakage, they possess an inherent directionality, and they provide a means of connecting the "clock" with the energy source. A "1" (or "0") is written by reducing (or not reducing) the first unit in the chain of electron transfer molecules. The bit is shifted with a light pulse and electrons are collected at the terminus of the chain. The design requirements for such a device and possible synthetic strategies are discussed. Devices along these lines should have lower energy usage and enhanced storage density.

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