

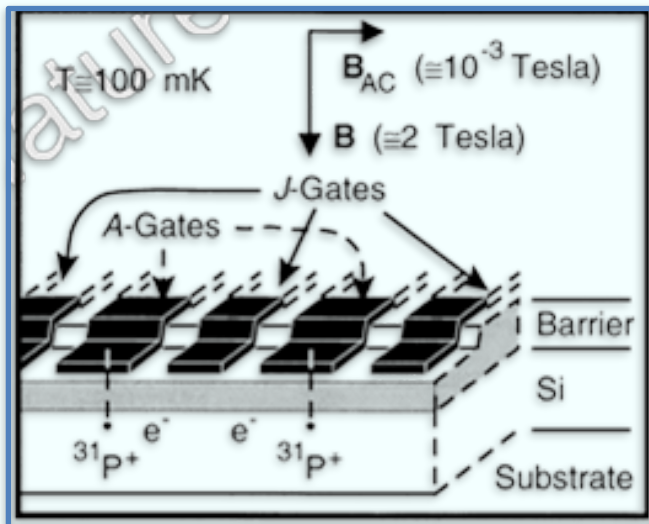


## A silicon-based nuclear spin quantum computer

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Quantum computers promise to exceed the computational efficiency of ordinary classical machines because quantum algorithms allow the execution of certain tasks in fewer steps. But practical implementation of these machines poses a formidable challenge. Here I present a scheme for implementing a quantum-mechanical computer. Information is encoded onto the nuclear spins of donor atoms in doped silicon electronic devices. Logical operations on individual spins are performed using externally applied electric fields, and spin measurements are made using currents of spin-polarized electrons. The realization of such a computer is dependent on future refinements of conventional silicon electronics.

Illustration of two  $^{31}\text{P}$  donor qubits with their electrons in a Si host, separated by a barrier from metal gates on the surface.

LINK TO FULL PAPER (SUBSCRIBERS ONLY)

[www.nature.com/nature/journal/v393/n6681/abs/393133a0.html#a1](http://www.nature.com/nature/journal/v393/n6681/abs/393133a0.html#a1)