PHYSICS OF COMPUTATION SEMINAR

Date: Wednesday, October 12, 1994
Time: Refreshments at 4:00pm
Talk at **4:15pm**
Place: 34-401A (Grier Room A)

Quantum Computing with Spins

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It has recently been recognized that computers could be profoundly more powerful, if the possibilities offered by the basic principles of quantum mechanics were fully exploited in their design. In a *quantum computer* we require that the binary state of a computer obeys quantum mechanics, i.e., can evolve along superpositions of different (logical) pathways which could interfere with one another. It has recently been shown that such a computer can perform a class of computational problems, including prime factorization, exponentially faster than any known algorithm on a classical computer. Our work has now established the logical primitives (the analog of AND and OR gates in classical boolean logic) needed for quantum computer design. However, they will be very difficult to build; like the electron in a double-slit experiment, the quantum bits must remain stringently isolated from all external perturbations throughout the course of their time evolution. I will outline the initial work which is being undertaken by physicists in several different disciplines to construct the elements of a quantum computer. One interesting proposal involves representing the quantum bits by individual spin-1/2 particles, and executing logic on these bits using an atomic force microscope.

Host: Norm Margolus

This talk is part of a seminar series on adapting computers and computations to the constraints of, and opportunities afforded by, microphysics; and on the development and application of the physical theory of computation and information. If you would like to receive electronic notice of these seminars, send email to "poc@im.lcs.mit.edu."