LABORATORY FOR COMPUTER SCIENCE

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PHYSICS OF COMPUTATION SEMINAR

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Place: 4-270

Quantum versus Classical Information: a Fruitful Dichotomy

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Classical information (the kind in newspapers) and quantum information (carried by certain states of elementary particles such as photons) are very different. Classical information can be read, copied, and transcribed into any medium, but it cannot be sent faster than the speed of light. Quantum information cannot be read or copied without disturbing it, but in some instances can propagate instantaneously or even backward in time. Together the two kinds of information can perform several feats that neither could do alone. These include quantum cryptographic systems, some of which have already been built, in which privacy of communications is guaranteed by the uncertainty principle; and a new technique, "quantum teleportation," by which an unknown quantum state (eg a photon of unknown polarization), can be dismembered into purely classical and purely nonclassical parts, transmitted through separate channels to a new location, and recombined there to produce a perfect reincarnation of the original state.

Host: Norm Margolus

This talk is part of a new 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. This series is being sponsored by the MIT Information Mechanics Group (Lab for Computer Science), in conjunction with the MIT Physics and Media Group (Media Lab), the MIT Porous Flow Project (Earth, Atmospheric and Planetary Sciences), and the Mathematical Sciences Research Group at Thinking Machines Corporation.