AI LABORATORY &
LAB FOR COMPUTER SCIENCE

MASSACHUSETTS
INSTITUTE OF
TECHNOLOGY

THEORY OF COMPUTATION
PHYSICS OF COMPUTATION
JOINT SEMINAR

Date: Thursday, February 27, 1997
Time: Refreshments at 4:00pm
Talk at **4:15pm**
Place: NE43-518

Reversible Space Equals Deterministic Space

Alain Tapp
University of Montreal

Charles Bennett has shown that deterministic machines can be efficiently simulated by reversible ones. Bennett's technique uses time $O(T^{1+\epsilon})$ and space $O(S \log T)$, where S and T are the space and time used by the original machine. It has been conjectured by Li and Vitányi that Bennett's technique is optimal regarding space. But we—Lange, McKenzie and Tapp—have recently shown that this conjecture is in fact false since RSPACE = DSPACE. This shall be my first topic.

Don Coppersmith and Edna Grossman had already stated an equivalent result for circuits. Every invertible function can be computed with a reversible circuit with one additional wire at the cost of an exponential increase in circuit depth. I will show that every invertible function can be computed with 2.58 extra wires but with read-only input. From Barrington's theorem on branching programs, I will also derive that problems in NC_1 (the class for logarithmic depth circuits) are computable by reversible circuits using 6 extra wires (extra bits) and read-only input in polynomial depth.

Hosts: Michael Frank and Mike Sipser

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@mit.edu."