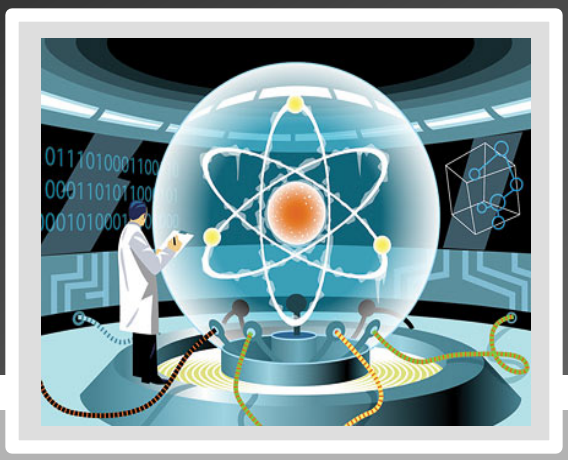
Edward Farhi, MIT

Quantum Computing

April 29, 4:30 p.m.
Town Hall – Leadership Studies
Kansas State University



All of the computing devices in use, from cell phone chips to laptops to massive computers solving complex math problems, are at their core using the same logical system based on binary arithmetic where information is stored in bits that take the value 0 or 1. However at the atomic level, nature is described by quantum mechanics. Quantum mechanics is a framework for describing physical law that is very different from the physical law that describes our everyday experience. It says that at its base nature is described by "probability amplitudes" and Yes, God does play dice with atoms! Quantum mechanics has led to a vast number of predictions that have been confirmed by experiment. It is the basis of all of chemistry and can be used to explain many properties of materials. It is then natural to ask if it could be advantageous to design computers based on quantum law rather than binary arithmetic. It has been shown that if we had a quantum computer it could solve certain problems faster than any classical computers. These include problems related to cryptography. I will discuss the prospects for building useful quantum computers in the near future and offer a flavor of the types of problems for which quantum computers may have advantages over classical.

James R. Neff Public Lecture

KANSAS STATE UNIVERSITY | Department of Physics