

ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

# *PHYSICS COLLOQUIUM*

Thursday 28 February 2008

17:00-18:00

3<sup>rd</sup> Floor Seminar Room

## *“Quantum Computation and Quantum Error-Correction”*

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### Abstract

Computers that coherently manipulate quantum states can solve problems which are intractable with any conceivable classical computer. They can be dangerous by factoring integers and breaking crypto-systems used widely on the internet, but they can also be valuable physics tools for simulating static or dynamical properties of quantum-mechanical systems. However, constructing useful quantum computers is a daunting task because quantum states are extremely susceptible to imperfections and noise. Various ideas have been proposed for protecting quantum computation from errors: quantum computers that operate fault-tolerantly by using quantum error-correction, quantum computers based on adiabatic evolution, or quantum computers storing information in topological degrees of freedom. I will review the basic concepts behind these proposals together with open problems, and discuss recent results that increase our confidence that large-scale quantum computers can be realized.