**Title and Abstracts of Keynote Speakers**

Prof. Dr. Edward Farhi:

**Quantum Money from Knots**

    Money, either in the form of bills or information on a computer, should be impossible to copy and also verifiable as good money when tendered to a merchant. Quantum mechanics may make this possible to achieve with far greater security than can be achieved without quantum mechanics.  Ideally Quantum Money is a cryptographic protocol in which a mint can produce a quantum state, no one can copy the state, and anyone (with a quantum computer) can verify that the state came from the mint without sending the money back to the mint.  I will discuss Quantum Money generally and present our scheme based on quantum superpositions of diagrams that encode knots.  This scheme is hopefully secure against computationally bounded adversaries and has not yet been broken.  Quantum Money may be the basis of E-commerce on a future quantum internet and would not require communication with a central server such as a credit card company.

Dr. Zoran Hadzibabic:

**Effects of interactions on Bose-Einstein condensation of an atomic gas**

I will discuss a series of recent experiments in which we studied various effects of interactions on the condensation of a dilute trapped atomic gas. First, we experimentally scrutinised the concept of purely statistical saturation of the thermal component as the driving mechanism for condensation [1]. We show that under usual experimental conditions ultracold atomic gases actually show strong deviation from Einstein's saturation picture, but saturation is recovered in the limit of vanishing interactions. Second, we experimentally observed for the first time the long-sought beyond-mean-field interaction shift of the critical temperature of a trapped gas [2], and related our measurements to the universal results obtained by Monte-Carlo calculations for a uniform system [3]. Finally, I will present some very recent measurements of non-equilibrium condensation dynamics following a quench of the interaction strength.

[1] N. Tammuz et al., PRL 106, 230401 (2011).

[2] R. P. Smith et al., PRL 106, 250403 (2011).

[3] R. P. Smith et al., PRL in print (2011), arXiv:1106.6295.

Dr. David P. DiVincenzo:

**Prospects for Superconducting Qubits**

I will give a review of the steady progress in achieving

high-fidelity superconducting qubits.  As with any "Moore's law"

phenomenon, this progress has not been the result of any one

breakthrough, but rather from a continual increase in the understanding

of the physics and engineering of the field.  I will discuss the next

steps of scaling this system, and the role that the surface code could

play in this.

Prof. Dr. Ignacio Cirac

**Creation and Detection of Strongly Correlated States in 1D Systems**

 We analyze the possibility to prepare a Heisenberg antiferromagnet with cold fermions in optical lattices, starting from a band insulator and adiabatically changing the lattice potential. The numerical simulation of the dynamics in 1D allows us to identify the conditions for success, and to study the influence that the presence of holes in the initial state may have on the protocol. We also extend our results to two-dimensional systems. Finally, we discuss the possibility of classifying gapped phases in 1D, as well as methods to detect them.