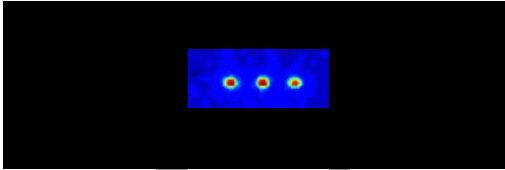


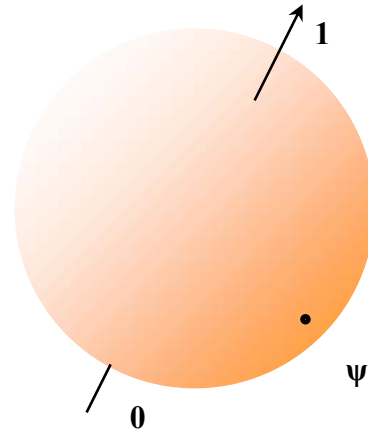
# COT 6600 Quantum Computing

## Quantum Computing – The Future of Supercomputing?



picture of 3 quantum bits: ions trapped in a magnetic field; laser pulses are used to manipulate the states of these ions

the state of a quantum state is represented by a point on a 3-dimensional sphere; 0 and 1 (states of a classical bit) correspond to the north and south poles



A quantum computer is a fundamentally new concept of computing. Its computational power is based on a new kind of logic where not only the Boolean values 0 and 1 occur but also “magic” superpositions  $\psi$  of these values (not to be confounded with classical analog or fuzzy logic). It has been shown that this “quantum” logic would allow us to solve several computationally hard problems more efficiently than it is possible with classical logic. The most prominent examples of quantum efficient algorithms are Shor’s algorithms for integer factorization and computing discrete logarithms, making it possible to break encryption schemes such as RSA and ElGamal.

In recent years, a new branch of computer science (“quantum computer science”) has emerged. It seeks to design fast algorithms relying upon quantum phenomena such as those “magic” superpositions. The goal of this class is to introduce the students to the basic theoretical concepts of this new field of science and also to the current research challenges and results.

Due to the interdisciplinary nature of quantum computing this class is suitable for students in computer science, electrical engineering, mathematics, physics, and nanotechnology. No special knowledge is required. All necessary interdisciplinary concepts will be introduced during the class.

**Term:** Fall 2007

**Time:** Tues, Thurs 4:30pm – 5:45pm

**Location:** HEC 0302

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