

## QUANTUM COMPUTERS

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Scientific and technological progress is changing faster and faster all the time. Technology is growing at an exponential rate. It is doubling every few years. Science and technology in the 20th century dawned with quantum theory. With quantum mechanics mankind acquired grand strength. The greatest achievement of Scientific and technological progress in quantum technology is a quantum computer.

Nowadays, we cannot imagine our life without computers and the fact is that they have become so important that nothing can replace them. They seem to be everywhere today. Since 1948 when the first real computer has been invented our life has changed so much that we can call it real digital revolution. Nowadays they are also used by scientist and they may also be as huge as the old ones but they are millions times faster. But the most powerful computer is a quantum computer.

Quantum computers have first been proposed by Richard Feynman in the early 80's. Experimental research was begun in 1990s. In 1994 Peter Shor from AT&T's Bell Laboratories in New Jersey devised the first quantum algorithm that, in principle, can perform efficient factorization of large numbers. The potential of Shor's algorithm stimulated many scientists to work toward realizing the quantum computers. Significant progress has been made in recent years by numerous research groups around the world. A prototype of a quantum computer has been built. The team of Aizek Chuang demonstrated the world's first 2-qubit quantum computer (in 1998 at University of California Berkeley). On the 19<sup>th</sup> of January 2007 Canadian company D-Wave demonstrated their 16-qubit quantum computer, called ORION. However, the company is extremely optimistic that the company plans to introduce a 512-qubit processor, followed by a 1,024-qubit processor in 2009.

A quantum computer is a device for computation that exploits quantum mechanical phenomena to perform operations on data. The feature of the quantum computer is ability to execute huge computing in very short time. Quantum computers can perform many different calculations in parallel: a system with  $n$  qubits can perform  $2^n$  calculations at once!

A classical, as well as a quantum computer, essentially consists of 3 parts: a memory, which holds the current machine state, a processor, which performs elementary operations on the machine state.