# Future of Multi-Core Processing

The near future of multi-processing could go down several paths. The simplest is to add more and more cores, but the advantage gained by adding cores diminishes as the overhead of synchronising work across them increases. This limitation led to the idea of ‘heterogeneous computing’, where several specialised processors types are used, each built to handle specific tasks efficiently. Typically, this is in the form of having a GPU (Graphics Processing Unit) to handle graphics rendering and perform calculations on large data sets whilst a general purpose CPU handles standard housekeeping and operating system tasks. There is also possibility of alongside trying to speed up processing by adding more power, making current processing methods more efficient could allow the same methods to be carried out in less time, use less power, and require less materials to create components.

As conventional computers follow Moore’s Law, which says that the number of transistors on a chip will double every two years, we will soon reach the point where transistors are on an atomic scale and cannot be made any smaller. Entirely new techniques would then need to be explored. One such technique is quantum computing, which aims to exploit the unique behaviours of atoms to perform processing and represent memory. Whereas standard computers store information using a series of bits which can have the value 1 or 0, quantum computers store information using ‘qubits’. These exploit quantum superposition to be able to simultaneously represent a 1, 0, and all points in between. This parallelism could lay the foundation of processing where millions of calculations can be performed at once in the time it takes a conventional computer to perform one. Several quantum computers have been demonstrated to work and have been able to compute algorithms, such as Shor’s algorithm for integer factorisation (used in cryptography), on relatively small 7 qubit computers[[1]](#footnote-1). Research is currently in its early infancy and doubts about the scalability of several notable designs (such as D-Wave Systems’ “first commercially available quantum computer”), and whether they can be proven to be true quantum computers whilst much about the field is still unknown, have been voiced by academics[[2]](#footnote-2).

1. Experimental realization of Shor's quantum factoring algorithm using nuclear magnetic resonance. Nature 414, 883-887 (20 December 2001). <http://www.nature.com/nature/journal/v414/n6866/full/414883a.html> [↑](#footnote-ref-1)
2. My visit to D-Wave: Beyond the roast-beef sandwich. Scott Aaronson. <http://www.scottaaronson.com/blog/?p=954> [↑](#footnote-ref-2)