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The future of computing

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Down-scaling has been the leading paradigm of the semiconductor industry since the invention of the first transistor in 1947. However miniaturization will soon reach the ultimate limit, set by the discreteness of matter, leading to intensified research in alternative approaches for creating logic devices. This talk will discuss the development of a radical new technology for creating atomic-scale devices which is opening a new frontier of research in electronics globally. We will introduce single atom transistors where we can measure both the charge and spin of individual dopants with unique capabilities in controlling the quantum world. To this end, we will discuss how we are now demonstrating atom by atom, the best way to build a quantum computer - a new type of computer that exploits the laws of physics at very small dimensions in order to provide an exponential speed up in computational processing power.