ZERNIKE INSTITUTE COLLOQUIUM

Thursday, June 9th, 2011

16:00h, Lecture Hall: 5111.0080 **Coffee and cakes from 15:30h**

Towards Atomically Precise Silicon Qubit Devices in all Three Dimensions

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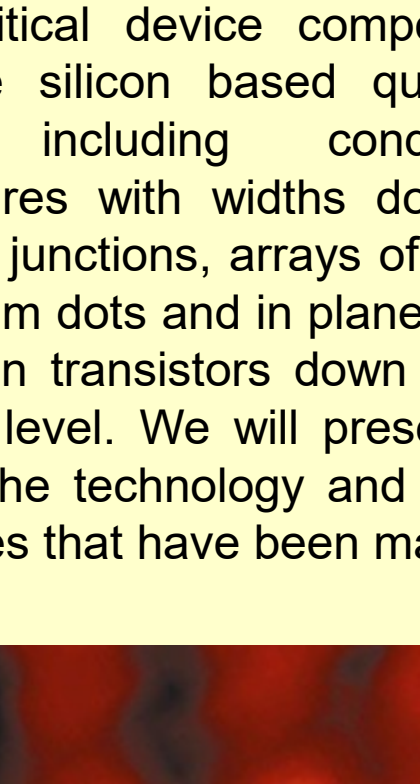
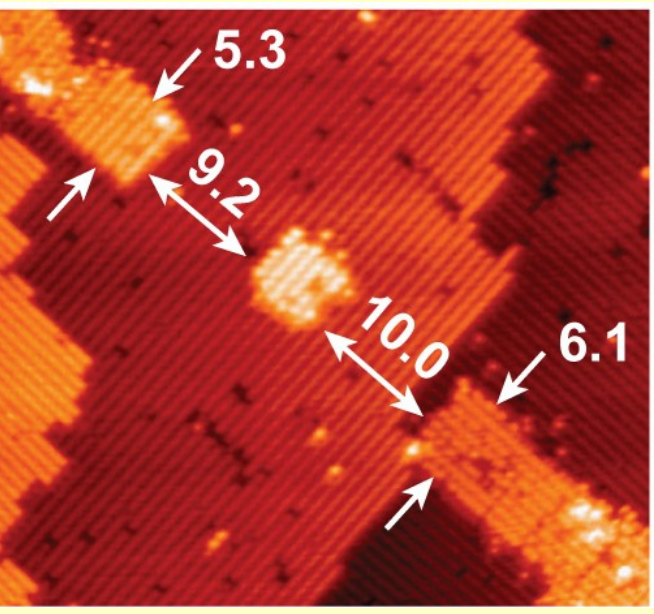
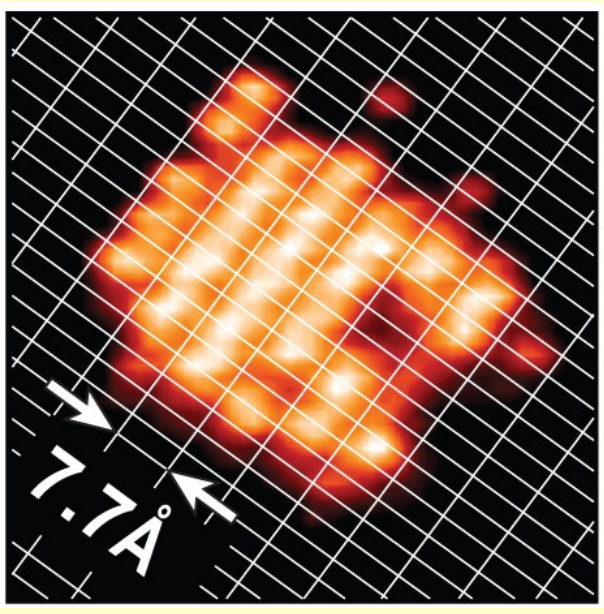
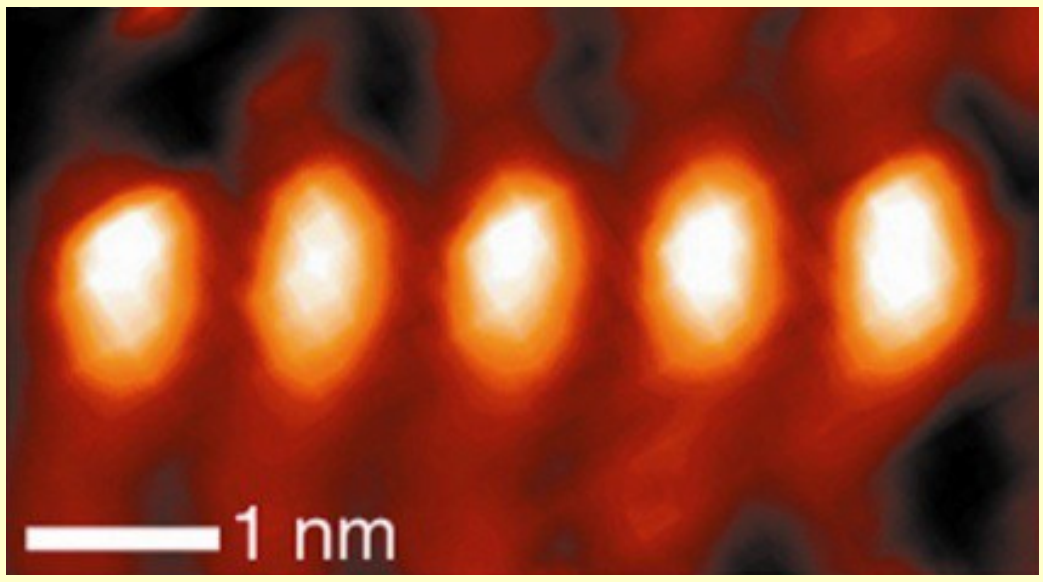






The talk will focus on recent low temperature transport measurements of few-to single P donor quantum dots in silicon. These systems are of interest both in terms of understanding the fundamental effects of quantum confinement on the silicon bandstructure, but also on the use of single P atoms as electron spin based qubits. We present transport through a deterministic single donor device, where we observe both the signature of a single donor directly through STM imaging and demonstrate that the charging energy and excited state spectrum is consistent with the orbital states of a single P-donor. Finally we present our latest results of spin read-out of the single electron spin associated with the precision placed single P atom and highlight some of the opportunities and challenges to achieving truly atomically precise devices in all three spatial dimensions.

Over the past five years we have developed a radical new strategy for the fabrication of atomic-scale devices in silicon. Using this process we have fabricated critical device components for scaleable silicon based quantum computing, including conducting nanoscale wires with widths down to ~2nm, tunnel junctions, arrays of donor based quantum dots and in plane gated single electron transistors down to the single donor level. We will present an overview of the technology and of the unique devices that have been made.



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