ZERNIKE INSTITUTE COLLOQUIUM

Thursday, February 5th, 2015

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

The next life of silicon

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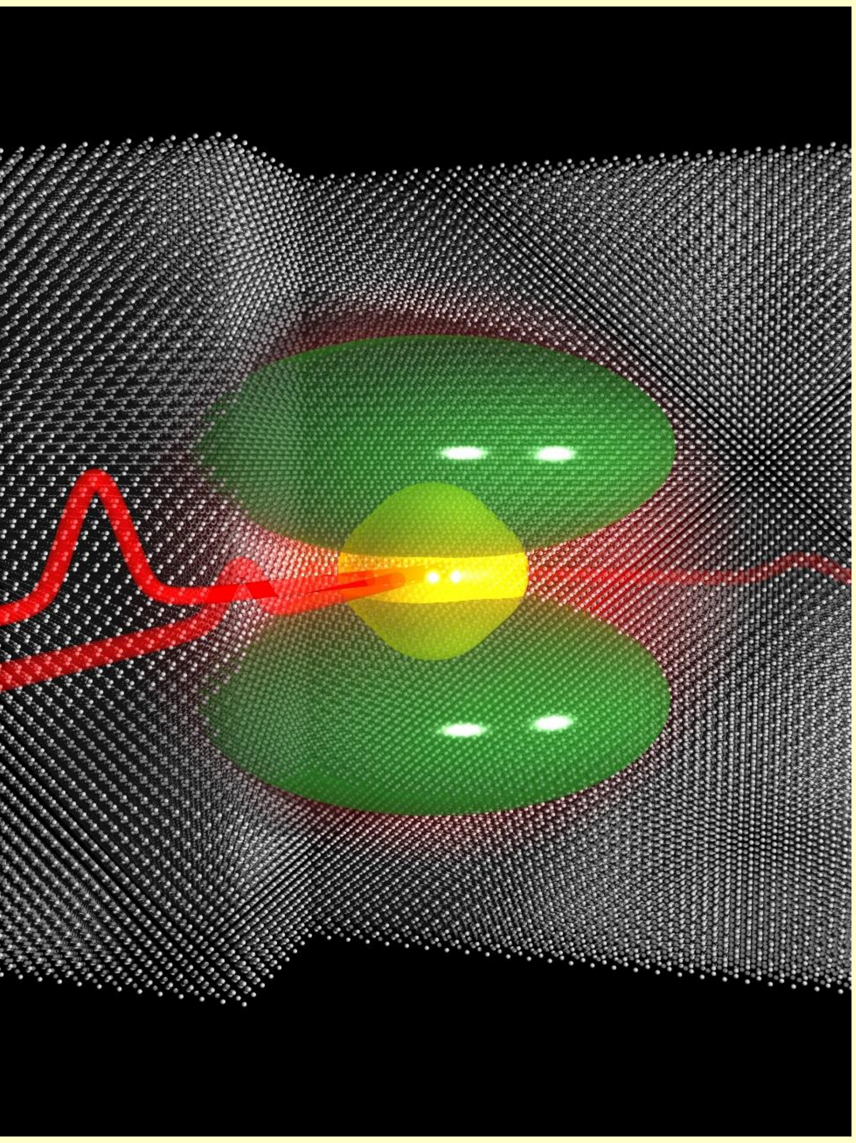
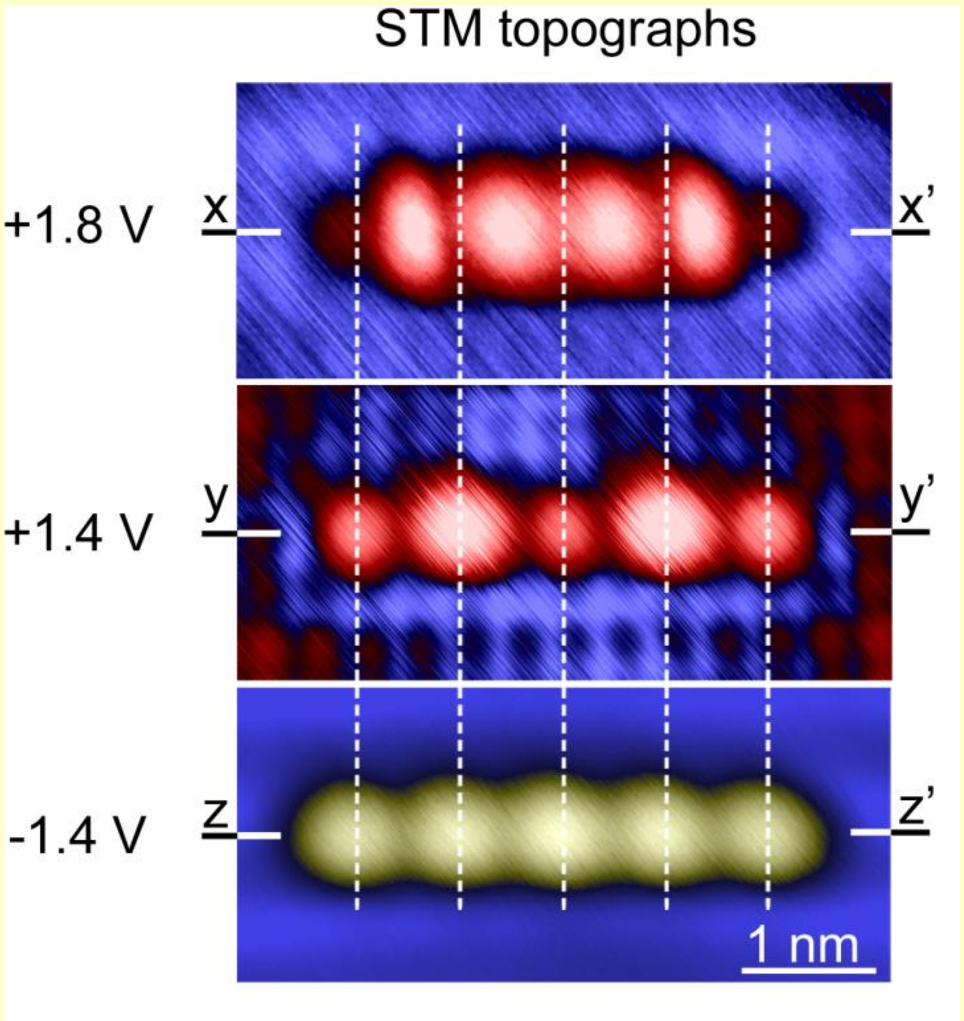


The 20th century has been distinguished by the silicon-based information revolution, where bits are encoded as charges which are manipulated and stored via field effect transistors. The continued exponential growth of information technology based on straightforward extrapolations of this paradigm is not guaranteed, and there has therefore been a search for both alternative paradigms and materials. The new paradigms entail exploitation of spin and orbital degrees of freedom, including related quantum phenomena. While “exotic” materials have been successfully used to demonstrate some of the associated physics, we show here that silicon may be an excellent host for the new effects. In particular, laser cooling and electromagnetic traps have led to a revolution in atomic physics, yielding dramatic discoveries ranging from Bose-Einstein condensation to quantum control of single atoms. Because it is a semiconductor of extraordinary cleanliness which can be acquired at low cost, silicon can also be thought of a poor man’s atom trap. We describe here the beginnings of the science of silicon as atom trap, where the trapped atoms are the donor impurities. Key tools, enabling the visualization and manipulation of the impurity quantum states, are free electron lasers and scanning tunneling microscopes.



References
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