Scanning Tunneling Microscopy: The Machine That Can See, Move and Manipulate Individual Atoms

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Abstract: Scanning tunneling microscopy (STM) offers a uniquely direct view into the quantum world, allowing us to see and manipulate individual atoms on surfaces. In this talk, I will unpack the core ideas that make STM possible and explore the practical considerations required to operate at the atomic scale. I will then highlight a selection of modern STM experiments—from single-atom imaging to electron spin resonance—that reveal surprising parallels with operations used in quantum computing. I invite you to join me for a tour through the nanoscopic world, where distance, cleanliness, and magnetic fields govern the quantum behavior of individual atoms.

Bio: Dr. Elbertse is a Postdoctoral Researcher at the National Institute of Standards and Technology (NIST) with the Nanoscale Processes and Measurements Group. He completed his PhD in the OtteLab at Delft, including six months at the Center for Quantum NanoScience in Seoul. His research focuses on investigating single atoms on surfaces using Scanning Tunneling Microscopy (STM), with a particular interest in magnetic atoms, their coherent control via Electron Spin Resonance (ESR), and the creation of atomic-scale devices. He also works on advancing STM instrumentation, especially upgrading its radio-frequency capabilities for ESR-STM.