

Atomic Microscopy of Surfaces; Photon Counting Statistics Experimental Development and Ion/Electron Beam Ultra-High Vacuum System Development

Experimental Nanophysics

Dr. David Richardson

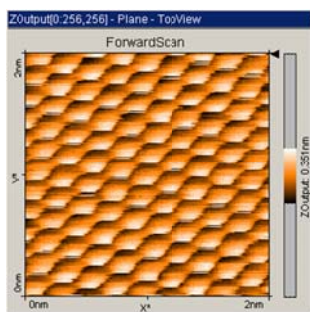
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Primary Funding: Northwest Applied Research (with expected funding from National Science Foundation [NSF])

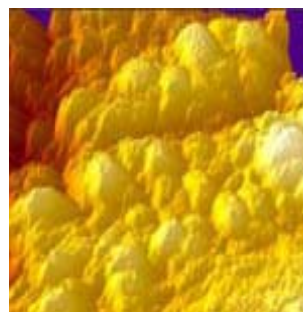
Description: Visualizing nano-structures is really the key to the development of the field of nanoscale science. Materials made use of nanoscale effects over many centuries, however, it is only now that we have begun to see what these structures are. As such, the imaging of material surfaces and structures down to the nanoscale is crucial for the subject.

Light has been the primary tool for imaging objects down to the micrometer scale. The wavelength of light is on the order of, or one to two orders of magnitude larger than the nanometer regime. So, except in specific circumstances (confocal microscope, etc), it cannot be used for imaging objects of nanometer size. This has led to the development of other techniques, such as Atomic Force Microscopy (AFM), and Scanning Tunneling Microscopy (STM), that utilize a different approach.

Students working with Dr. Richardson will use AFM's and STM's as well as other techniques deemed necessary to image structures down to the nanometer size and analyze those structures. They will work independently on projects using the aforementioned devices and may also be required to learn other techniques in either the synthesis or analysis of the materials/surfaces.



Scanning tunneling microscope image of a graphite surface



Scanning tunneling microscope image of a collection of silver nanoparticles.

➤ Student Researchers:

Atomic Microscopy of Surfaces

- Zheng Dong (currently in Medical School, NU)
- Chaeyeon Kim (currently in Undergraduate program, University of Illinois – Urbana-Champaign)
- Priscilla Choo (currently in Undergraduate program, Rutgers University)
- Alex Speltz (currently in Graduate program, University of Cambridge)
- Jessica Ellis

Additionally, Dr Richardson is developing two other areas of research and these are still in the early stages. Students would be required to build, test, and troubleshoot the systems in order that attain the necessary qualities required for their eventual use. These are skills needed by experimental scientists no matter their field.