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Nanocharacterization with Scanning Probes.

We specialize in characterizing novel materials at the nanoscale by designing and building scanning probe microscopes. Typically the phenomena of interest occur at low temperatures, such as superconductivity or magnetic transitions. We have therefore developed low temperature microscopes based on tunneling or force interactions that can measure a wide variety of properties at temperatures down to 4 Kelvin and fields up to 8 Tesla. We can probe the local density of states with STM and the local conductivity with contact AFM, or the local stray magnetic fields with a Hall probe and the field gradients with MFM. The Kelvin probe mode of our AFM gives us a calibrated map of the local potential. All these techniques are complementary in terms of the information they provide and the spatial resolution they achieve. They also differ in sensitivity and in the degree to which they perturb the sample. In this talk I will review recent examples in the characterization of diluted magnetic semiconductors, multiferroic materials, and pseudocubic and bilayer manganites.

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