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**Low Temperature Scanning Tunneling Microscopy of High Temperature Superconductors: What We Gain By Taking a Closer Look<sup>1</sup>**  
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Scanning tunneling microscopy (STM) and spectroscopy have been applied to a wide variety of experimental systems. In this talk I will focus on one which was discovered at nearly the same time as STM – high temperature superconductors. After two decades of intense research these materials still hold many mysteries, mainly due to the rich variety of states of matter that may coexist, cooperate, or compete with superconductivity. I will present the unique perspective that STM is capable of bringing to our study of these materials through atomic-scale temperature dependent mapping of the density of states. After describing widely observed spatial “checkerboard” patterns which we have found to have a distinct doping dependence suggestive of charge density wave order, I will demonstrate how local variations of this order can help us understand nanoscale inhomogeneity in these materials. Taken together, these results not only show the power of STM to untangle complex nanoscale phenomena but also suggest a new path towards understanding high temperature superconductivity.

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