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Title: Progress in the computational search for higher-Tc superconductors

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Numerical calculations of the two-dimensional Hubbard model have found many phenomena that are also observed in unconventional superconductors, including antiferromagnetism, d-wave superconductivity as well as pseudogap and stripe behavior. This model is therefore believed to provide a basic framework for understanding the nature of the electronic pairing mechanism that leads to unconventional superconductivity. In this talk, I will present dynamic cluster quantum Monte Carlo simulations of this model as well as extensions that include a bilayer and a dimer Hubbard model, and discuss what these calculations tell us about the factors that determine the transition temperature in unconventional superconductors. In particular, I will focus on the effects of correlations, quantum critical points and electronic inhomogeneities and the role of multiple Fermi surfaces and changes in the spin-fluctuation spectral weight. I will close with a summary of the optimal conditions for unconventional superconductivity and the guidance obtained from these simulations in the search for higher-Tc superconductors.