Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Topological Theory of Electron-Phonon Interactions in High Temperature Superconductors J.C. PHILLIPS, Dept. of Physics and Astronomy, Rutgers University, Piscataway, N. J., 08854-8019 — The large isotope effects in the phonon kinks observed in photoemission spectra (ARPES) of optimally doped cuprate high temperature superconductors (HTSC) seem to suggest that other particles (such as magnons) must be contributing to HTSC. Here we use topological (non-Hamiltonian) methods to discuss the data, emphasizing nanoscale phase separation and the importance of a narrow band of quantum percolative states near the Fermi energy that is spatially pinned to a nonmagnetic *self-organized* filamentary dopant array. Topological discrete, noncontinuum, nonperturbative methods explain the "miracle" of an ideal nearly free electron phonon kink in sharply defined nodal quasiparticle states in LSCO at the metal-insulator transition. Finally the universality of the kink energy and Fermi velocity in different cuprates is the result of the marginally elastic nature of these materials, and specifically the isostatic character of the CuO_2 planes.

J.C. Phillips
Dept. of Physics and Astronomy, Rutgers University

Date submitted: 19 Nov 2004 Electronic form version 1.4