Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Gradient interactions and the low temperature universality in glasses MOSHE SCHECHTER, PHILIP STAMP, University of British Columbia
— Amorphous solids show striking universal characteristics at low temperatures, including unique temperature dependencies of the specific heat, thermal conductivity and internal friction, and a small and rather constant ratio between a phonon wavelength and its mean free path. These universal phenomena are observed in polymers and disordered lattices as well. The standard tunneling model proposed by Anderson, Halperin and Varma, and Philips, accounts well for much of the observed phenomena. However, questions regarding the nature of the two-level systems, the smallness of the above ratio, and the energy scale dictating the temperature range of the phenomena, remain unanswered. We propose a theory that suggests an answer to these questions, along with an explanation of the additional observed phenomena connected with the universal behavior. Our theory is rigorously derived for disordered lattices, and we argue for the plausibility of its applicability to amorphous solids.

Moshe Schechter
University of British Columbia

Date submitted: 20 Nov 2008 Electronic form version 1.4