Daniel Ueltschi: *Random permutations and Bose-Einstein condensation*

Abstract:
I will present a model of random permutations from the lattice $\mathbb{Z}^d$ into itself, where each site can travel only a finite distance. The motivation for this model is Feynman's approach to the phenomenon of Bose-Einstein condensation. Feynman conjectured that this phase transition is related to the presence of cycles of infinite length.

These random permutations offer an interesting challenge to probabilists, discrete mathematicians, and statistical physicists. I will prove that no infinite cycles are present at high temperature, and I will discuss numerical evidence that infinite cycles are present at low temperature in three dimensions. A surprising feature is that long cycles are macroscopic, and their number is random and finite.