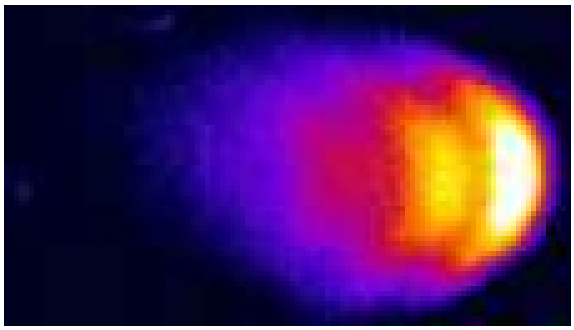
The 2006 Fall Condensed Matter Seminar Series presents:

# Dr. Helmut Katzgraber (ETH Zurich)

## *"Ramping Fermions in Optical Lattices across a Feshbach Resonance"*




**Abstract:**

Ultracold atoms loaded into optical lattices are nearly ideal experimental realizations of quantum lattice models. Because numerical simulations of fermionic systems are NP hard and no general analytical solution exists, experiments on ultracold fermionic gases in optical lattices could thus be very useful in elucidating the properties of the fermionic Hubbard model and to probe exotic quantum phases, such as d-wave resonating valence bond (RVB) phases. A key ingredient in engineering lattice models and tuning interactions between particles are Feshbach resonances. We discuss the properties of ultracold Fermi gases when crossing a Feshbach resonance and explain the short molecule lifetimes found in recent experiments, as well as the lifting of fermions into higher bands due to entanglement of Bloch states. By relating the double occupancy of the lattice to the temperature, we provide a means for thermometry in fermionic lattice systems, previously not accessible experimentally. Our thermometry results explain the low molecule formation rates and show that current experiments are performed at temperatures higher than expected: considerably lower temperatures are required for fermionic systems to be used as quantum simulators. Work done in collaboration


Thursday, August 31, 2006
304 Robeson Hall
2:00 P.M.