Dr. Joaquín E. Drut

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NQPI Special Seminar

Tuesday, February 10, 2010 - Clippinger 259 at 2:30PM

Dr. Joaquín E. Drut

Nuclear Theory Group @ OSU Physics

What can lattice QCD do for condensed matter physics?

Sophisticated algorithms and hardware advances, recent and not-so-recent, have propelled the field of lattice QCD to the forefront of large-scale high-performance computing. Are condensed matter theorists reaping the benefits of these developments? In this talk I will discuss two cases in which lattice QCD methods are directly applicable to condensed matter systems: graphene and cold atoms in the BEC-BCS crossover. In the case of graphene, those methods have allowed us to study the onset of spontaneous chiral symmetry breaking in the non-perturbative regime of strong Coulomb coupling. We have found that this phenomenon is likely to occur for suspended graphene samples as a second order phase transition. The same advanced algorithms are making it possible to perform large-scale simulations of cold atoms in the BEC-BCS crossover, surpassing the limitations of determinantal Monte Carlo and allowing us to get closer to the thermodynamic limit. I will give an overview of the current status of the field focusing on the unitary limit, where numerical simulations are essential as the system is maximally strongly coupled.

Refreshments to Follow!!