



LUND
UNIVERSITY

MATHEMATICAL PHYSICS

Seminar

Prof. Nikolay Prokof'ev

Department of Physics

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Thursday March 10 at 14:00 (sharp), C368.

After the talk there will be coffee & cake.



Wandering amongst Feynman Diagrams for strongly correlated fermions

Feynman diagrams is the most celebrated tool of theoretical physics. Nearly all key models in physics are subject to the diagrammatic technique but in the strongly correlated regime it is often considered useless/hopeless/divergent/ (you curse it) and is reduced to just one(!) lowest-order skeleton graph. I will argue that diagrammatic expansions form a suitable representation for Monte Carlo simulations of interacting many-body systems with enormous and yet to be explored potential. The first application of the new Bold Diagrammatic Monte Carlo (BDMC) method which samples millions of fully dressed irreducible Feynman diagrams and extrapolates results to the infinite diagram order was to the unitary gas of ultra-cold fermions which have fundamental connections to high- T_c superconductivity, neutron matter, rich phase diagram, and polaron physics. We observe excellent agreement with highly accurate thermodynamic data from MIT for 6Li atoms everywhere in the normal phase. I will also discuss how BDMC works for models of frustrated quantum magnetism and the Fermi Hubbard model.