

TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Wednesday, 14 October 2015, 9:00 a.m.
Room 1036 Wachman Hall

(refreshments and social at 8:45 a.m.)

Preconditioning of the Overlap Operator in lattice QCD Simulations

by Andreas Frommer
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Abstract. Lattice QCD (quantum chromodynamics) simulations are today's most widely used tools to numerically compute observables from QCD, the fundamental theory of the quarks as the constituents of matter. We will present results based on a long-lasting cooperation with colleagues from physics. We consider the overlap operator, a discretization of the QCD Dirac-equation which preserves chiral symmetry at the expense of resulting in a complex operator involving the matrix sign function. The key ingredient to the efficient solution of systems with the overlap operator is a preconditioning approach which resembles "auxiliary space" preconditioning. This means that we use a multigrid solver for a different discretization, namely the Wilson discretization. We will present theoretical results based on a spectral analysis of the relevant operators which also leads the way to optimal parameter choices. Numerical results on lattices up to size 64^4 will be presented.