Ron Morgan
Linear Equations with Multiple Right-hand Sides

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This talk will concentrate on symmetric and Hermitian systems with multiple right-hand sides, but work on nonsymmetric problems may also be mentioned. We first give the Lan-DR method. It is a restarted Lanczos algorithm that solves a system of linear equations and simultaneously computes both eigenvalues and eigenvectors. We will discuss the relationship of Lan-DR to other methods such as GMRES-DR (a deflated GMRES approach), implicitly restarted Arnoldi, and thick restart Lanczos. We will give some reorthogonalization approaches, including a combination of Parlett and Scotts selective orthogonalization and Simons partial orthogonalization.

For systems of linear equations with multiple right-hand sides, one approach is to solve the first system with Lan-DR and then use the eigenvectors generated to assist solving the other right-hand sides. A deflated conjugate gradient method can be implemented that has a projection over the eigenvectors followed by CG. We also consider seed methods for solving multiple right-hand sides and suggest some improvements. Both deflated CG and the new seed CG will be tested on Hermitian problems from QCD.