1135-65-701 **Andreas Frommer**, **Kathryn Lund*** (katlund@temple.edu) and **Daniel B. Szyld**. *A new framework for understanding block Krylov methods applied to the computation of functions of matrices.*

Since Dianne O'Leary's seminal paper on block conjugate gradients (CG) in 1980, block Krylov subspace methods have been used widely to solve linear systems with multiple right-hand sides. Recently, these methods have been used to compute $f(A)B$, where f is a scalar function defined on the matrix $A \in \mathbb{C}^{n\times n}$ and $B \in \mathbb{C}^{n\times s}$. Hinging on a generalized framework for block Krylov subspaces that encompasses established results not only for the "classical" block methods (as in O'Leary's work), but also for global methods and the newer "loop-interchange" methods, we define a block full orthogonalization method for functions of matrices (B(FOM)^2) whose approximations lie in a generalized block Krylov subspace. This method is shown to converge for Stieltjes functions and Hermitian positive definite matrices with CG-like bounds, even with restarts. We demonstrate the performance and versatility of B(FOM)^2 in a variety of numerical experiments, even for non-Hermitian matrices and non-Stieltjes functions. Important applications include the sign function in quantum lattice chromodynamics and the matrix exponential in differential equations. (Received September 13, 2017)