1086-65-1101 **Thomas Strohmer*** (strohmer@math.ucdavis.edu), Department of Mathematics, UC Davis, Davis, CA 94306. *PhaseLift: Exact Phase Retrieval via Convex Optimization.*

Phase retrieval is the problem of reconstructing a function, such as a signal or image, from intensity measurements, typically from the modulus of the diffracted wave. Phase retrieval problems - which arise in numerous areas including X-ray crystallography, astronomy, diffraction imaging, and quantum physics, are notoriously difficult to solve numerically. They also pervade many areas of mathematics, such as numerical analysis, harmonic analysis, algebraic geometry, combinatorics, and differential geometry. In this talk I will introduce a novel framework for phase retrieval, which comprises tools from optimization, random matrix theory, and compressive sensing. I will prove that for certain types of random measurements a signal or image can be recovered exactly with high probability by solving a convenient semidefinite program - a trace-norm minimization problem, without any assumption about the signal whatsoever and under a mild condition on the number of measurements. Our method is also provably stable vis-a-vis noise. I will then discuss how this approach carries over to the classical phase retrieval setting using multiple structured illuminations. Numerical aspects of the proposed approach will be presented and applications to terahertz imaging will be discussed. (Received September 18, 2012)