Meeting: 1005, Newark, Delaware, SS 3A, Special Session on Mathematical Methods in Electromagnetic Wave Propagation

1005-78-28 **D. Russell Luke*** (`rluke@math.udel.edu`), Department of Mathematical Sciences, 501 Ewing Hall, Newark, DE 19716-2553. *A New Generation of Nonconvex Projection Algorithms for Phase Contrast Tomography.*

In recent years, improvements in electromagnetic sources, detectors, optical components, and computational imaging have made it possible to achieve three-dimensional atomic-scale resolution using tomographic phase-contrast imaging techniques. These greater capabilities have placed a premium on improving the efficiency and stability of phase retrieval algorithms for recovering the missing phase information in diffraction observations. In some cases, so called *direct methods* suffice, but for large macromolecules and nonperiodic structures one must rely on numerical techniques for reconstructing the missing phase. This is the principal motivation of our work. We report on recent progress in algorithms for iterative phase retrieval. The theory of convex optimisation is used to develop and to gain insight into counterparts for the nonconvex problem of phase retrieval. We propose a relaxation of averaged alternating reflectors and determine the fundamental mathematical properties of the related operator in the convex case. Numerical studies support our theoretical observations and demonstrate the effectiveness of the newer generation of algorithms compared to the current state of the art. (Received January 13, 2005)