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Yuan Gao* (yg86@duke.edu). *Nonlocal equation/systems: dislocation dynamics and Dyson Brownian motion.*

Dislocations are important line defects in crystalline materials. In this talk, I will first talk about the static Peierls-Nabarro (PN) models for a single straight/curved dislocation line, which can be reduced to a Ginzburg-Landau equation/systems involving "anisotropic half-Laplacian". The existence of global minimizers and the exponential relaxation of dynamic solutions to the global minimizer (uniquely determined) will be discussed. Second, the mean field limit of N straight dislocations (with global interactions between each other) leads to the Dyson equation, which is the trace equation of the complex Burgers equation with a force term on the upper half complex plane. The global weak solution and the convergence (after space-time rescaling) to the steady dislocation density function satisfying Wigner's semicircle law will be discussed. (Received January 16, 2020)