New Algorithms for Grain Boundary Motion, with Applications to Grain Size Distribution in Thin Films

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I will describe recent progress in extending Merriman, Bence, and Osher's threshold dynamics (MBO) algorithm for mean curvature motion (which in its original form works only for networks with isotropic and equal suface tensions) to grain boundary networks where the surface energy of each interface can potentially have a different anisotropic (normal dependent) energy density. This is joint work with Matt Elsey and Felix Otto. As in the isotropic but unequal surface tension case, it is based on finding a new Lyapunov functional for the original MBO scheme, which then elucidates how to correctly extend the algorithm to the more general models of iterest to materials scientists.

I will also demonstrate how the new algorithms allow us to investigate unresolved questions concerning the statistics of grain sizes in fiber textured thin films.