

Department of Applied and Computational Mathematics and Statistics Colloquium

Yekaterina Epshteyn
Department of Mathematics
University of Utah

will give a lecture entitled:

*Microstructure, Critical Events, Entropy and the Grain Boundary Character
Distribution*

Abstract

Cellular networks are ubiquitous in nature. They exhibit behavior on many different length and time scales and are generally metastable. Most technologically useful materials are polycrystalline microstructures composed of a myriad of small monocrystalline grains separated by grain boundaries. The energetics and connectivity of the grain boundary network plays a crucial role in determining the properties of a material across a wide range of scales. A central problem in materials science is to develop technologies capable of producing an arrangement of grains - a texture - appropriate for a desired set of material properties. In this work we discuss the role of energy in texture development. For this, a recently discovered Grain Boundary Character Distribution is introduced and investigated by the use of a large scale simulations and mathematical analysis. Grain Boundary Character Distribution (GBCD) is a new characterization of the texture which is found to be strongly correlated to the interfacial energy. We introduce the simplified critical event model and we derive an entropy based theory based on mass transport and a Kantorovich-Rubinstein- Wasserstein metric to suggest that, to first approximation, the GBCD behaves like the solution to a Fokker-Planck Equation. This is joint work with K. Barmak, E. Eggeling, M. Emelianenko, D.Kinderlehrer, R. Sharp and S. Ta'asan.



Monday, November 21st, 2011
4:00 p.m. to 5:00 p.m.
127 Hayes-Healy Center