Applied Mathematics

McGill Applied Mathematics Seminar Series

Tuesday *11 November 2003*

Mitchell Luskin
School of Mathematics
University of Minnesota

Title: "Metastability and Microstructure in Structural Phase Transformations"

Time: 10am **Room: Burnside 920**

Coffee and refreshments will be served after the seminar

Abstract: Microstructure, phase transformation, and metastability offer great challenges to the development of mathematical models, analysis, and computation. I will present some solutions to these problems that I have developed in the context of Martensitic structural phase transformations. Martensitic crystals undergo a first order structural phase transformation between a high symmetry crystalline phase and several variants of a low symmetry crystalline phase (such as the cubic to orthorhombic transformation in some CuAlNi alloys). These crystals are observed to be in metastable states exhibiting a fine-scale spatial oscillation between the variants of the low symmetry phase, and hysteresis is observed as the temperature or boundary forces are varied. I will present computational methods and a numerical analysis for this microstructure, and I will discuss several multiscale methods and the different metastable states that they compute.

My goal is to make this lecture accessible to the general mathematical and scientific community (in particular, all terms used above will be explained and illustrated).