Analysis and Computation of Crystal Microstructure

<u>J. M. Ball</u>[1]

Abstract: The lecture will survey some of the modelling, analytic and computational challenges that arise in understanding the formation of microstructure in crystals due to phase transformations involving a change of shape of the underlying crystal lattice at a critical temperature. The main modelling issues concern what the correct dynamical equations are (especially as regards the mobility of interfaces), and how to model interfacial energy, and are intimately connected to the passage from atomistic to continuum theories. From an analysis perspective there are deep unresolved issues of existence of solutions and approach to equilibrium. Computationally the fineness of the microstructure means that the problems are highly intensive, and the structure of the equations and multiple interfaces in solutions pose difficult problems of validation and mesh/function space dependence.

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[1]   Mathematical Institute, University of Oxford
      24-29 St Giles', Oxford OX1 3LB, United Kingdom
      ball@maths.ox.ac.uk