

**John Mackenzie**

*On the Computational Modelling of Eukaryotic Cell Migration and Chemotaxis*

A computational framework is presented for the simulation of eukaryotic cell migration and chemotaxis. An empirical pattern formation model, based on a system of non-linear reaction-diffusion equations, is approximated on an evolving cell boundary using an Arbitrary Lagrangian Eulerian surface finite element method (ALE-SFEM). The solution state is used to drive a mechanical model of the protrusive and retractive forces exerted on the cell boundary. Movement of the cell is achieved using a level set or parameterised finite element method. Results are presented for cell migration with and without chemotaxis. The simulated behaviour is compared with experimental results of migrating *Dictyostelium discoideum* cells.