Meeting: 1003, Atlanta, Georgia, SS 28A, AMS-SIAM Special Session on Reaction Diffusion Equations and Applications, I

1003-65-138 **A. L. Pardhanani*** (anand@cfdlab.ae.utexas.edu), Institute for Computational Engr. & Sciences, The University of Texas at Austin, 1 University Station C0200, Austin, TX 78712-0227, and **D. Pinto**, **A. J. Staelens** and **G. F. Carey**. *Numerical effects in the modeling and simulation of chemotaxis in biological reaction-diffusion systems.*

Chemotaxis phenomena arise in a variety of biological systems, and promote local aggregation of organisms, which are believed to migrate up concentration gradients of the attractant. In conjunction with reaction and diffusion, chemotaxis can lead to a wide range of complex dynamical behaviors and spatio-temporal patterns. In the present work we investigate coupled reaction-diffusion-chemotaxis PDE models for biological systems proposed in the literature, implement numerical models and carry out parallel simulations. We consider various discretization approaches based on finite difference, finite element and finite volume methods. A key concern is that the inclusion of chemotaxis produces results that are very sensitive to the mesh and other details of the numerical approximation. We demonstrate the existence of multiple (numerical) solutions for representative bacterial and slime-mold models, and develop strategies for both computing and assessing the validity of numerical results. We have also carried out preliminary investigations of model sensitivity to key chemotaxis parameters. (Received August 10, 2004)