David Iron
Applied Mathematics

Analysis of biological models: Mathematics has become a very important tool in the analysis of biological models. A theoretical model can be modified easily, and continuous measurements are readily available. Such systems often have interesting mathematical properties, such as self-organization, and are of intrinsic mathematical interest. To study such systems Dr. Iron employs perturbation methods, asymptotic analysis, dynamical systems and scientific computation. Currently I am working with several different systems ranging in scale from intracellular processes to the interaction of various cell populations.

Artery blocking plaque: Atherosclerosis, the formation of a fatty plaque which may block an artery, is one of the leading causes of death today. Dr. Iron uses a reaction-diffusion type of system to model the interplay of the various cell types and signaling molecules. The formation of a fatty plaque is just the spatial localization of some of the variables and thus well suited to our methods.

Intracellular signaling: Currently Dr. Iron is considering the initiation of the intracellular signal. Specifically the mechanism for the aggregation of cell surface receptors in the presence of signaling molecules.

Reaction diffusion PDEs: A third problem Dr. Iron is investigating the effect of delay on reaction diffusion partial differential equations. The delay is added to mimic the time needed to complete some of the complex reactions which occur in a cell.

Egg fertilization: A fourth project is a study of the formation of polarity of nematode ova after fertilization. Following fertilization, various proteins in the egg are isolated to well defined regions within the cell separated by sharp boundaries. Dr. Iron is now studying the role of the geometry of the cell in making the location of the interface *robust.*

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