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Systems Biology as a source of interesting problems in mathematics.

The Life Sciences are in the midst of a major revolution in quantitative theoretical formulations, perhaps not unlike the transformation that physics underwent starting in the 17th century. It is widely recognized by leading biologists that the typical “reductionist” approach is not powerful enough to describe, analyze, and interpret the complex behaviors of networks involving DNA, RNA, proteins, metabolites, and small molecules in cells, including the signal transduction pathways that play a central role in cancers and other diseases.

Quantitative (i.e, mathematical) formalisms, concepts, tools, and models are required, and there is a major role to be played by mathematicians in applying and adapting known theory to model and understand specific systems. Conversely, the study of problems in molecular systems biology leads naturally to new mathematical questions in established areas of mathematics (probability, theoretical computer science, control theory, PDE’s, and algebraic geometry, to name a few). The talk will introduce the general topic, and discuss an example of new theoretical developments. (Received June 11, 2008)