Meeting: 1003, Atlanta, Georgia, SS 29A, AMS Special Session on Mathematical Sciences Contributions to the Biomedical Sciences, I

1003-92-1471 **Gheorghe Craciun*** (gcraciun@mbi.ohio-state.edu), Mathematical Biosciences Institute, Ohio State University, 231 W 18th Avenue, Columbus, OH 43210, and **Martin Feinberg** (feinberg.14@osu.edu), Department of Chemical and Biomolecular Eng., Ohio State University, 140 W 19th Avenue, Columbus, OH 43210. *Understanding Bistability in Complex Biochemical Reaction Networks.*

Cell biology is based in large part on the operation of modules consisting of intricate biochemical reaction networks. Reliable cell function seems to necessitate very stable behavior from certain large biochemical modules. On the other hand, certain other biochemical modules might require, as part of their function, the capacity to exhibit more interesting behavior – for example, the capacity to engender two very different steady states corresponding to high and low production rates of some signaling intermediate.

Without the help of an overarching theory, the task of studying the behavior of complex reaction networks would seem extremely daunting. Such a theory is indeed possible, for there is a precise way in which a reaction network gives rise (up to parameter values) to differential equations governing the species concentrations. Thus, we can look for qualitative connections between reaction network structure and the variety of dynamics that the induced differential equations might exhibit.

Our aim will be to show how reaction diagrams, similar to those that biochemists normally draw, carry deep and subtle information about a reaction network's capacity to exhibit bistability. We shall also discuss implications for the interpretation of experiments. (Received October 05, 2004)