

COLLOQUIUM  
UNIVERSITY OF PITTSBURGH  
OCTOBER 13, 2006  
704 THACKERAY HALL  
4:00 P.M.

SPEAKER: **PROFESSOR MARTIN FEINBERG**

DEPARTMENTS OF CHEMICAL ENGINEERING AND MATHEMATICS  
OHIO STATE UNIVERSITY

TITLE: **UNDERSTANDING BISTABILITY IN COMPLEX ENZYME-  
DRIVEN REACTION NETWORKS**

ABSTRACT: In nature there are millions of distinct networks of chemical reactions that might present themselves for study at one time or another. Each network gives rise to its own system of differential equations. These are usually large and almost always nonlinear. Nevertheless, the reaction network induces the corresponding differential equations (up to parameter values) in a precise way. This raises the possibility that qualitative properties of the induced differential equations might be tied directly to reaction network structure.

Chemical reaction network theory has as its goal the development of powerful but readily implementable tools for connecting reaction network structure to the qualitative capacity for certain phenomena. The theory goes back at least to the 1970s\*. It has not been specific to biology, but, for obvious reasons, there is now growing interest in biological applications. Very recent work (with Gheorghe Craciun) has been dedicated specifically to biochemical networks driven by enzyme-catalyzed reactions. In particular, it is now known that there are remarkable and quite subtle connections between properties of reaction diagrams of the kind that biochemists normally draw and the capacity for biochemical switching. My aim in this talk will be to explain, for an audience unfamiliar with chemical reaction network theory, those tools that have recently become available.