UCDAVIS UNIVERSITY OF CALIFORNIA Hydrologic Sciences Graduate Group Presents

Special Colloquium Series, Spring & Fall 2005:

Between Nature and Science:
Advanced Modeling Concepts for Environmental Sciences

Brian G. Higgins
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and Materials Science
University of California, Davis

Exploring Chemical Reaction Networks in Science and Technology

October 6th
4:00-5:00pm
PES 3001
Light refreshments provided

In recent years the study of network architectures has become increasingly important in understanding complex systems in different branches of science and technology. Examples include metabolic networks (network of metabolites connected by chemical reactions), the Internet (a network of servers), the World Wide Web (a network of web pages), social networks. In this talk we are going to focus on chemical reaction networks in which a network of arbitrary chemical species are connected by chemical reactions. Chemical reaction networks tend to be the rule not the exception in many industrial chemical plants, where the synthesis route for producing a desirable product typically involves numerous chemical steps. I will begin the talk with an mathematical overview of stoichiometry, the foundation for understanding chemical reaction networks, and then proceed with a review of several example chemical reaction networks based on mass action kinetics that display varied dynamically properties. Then we will use concepts from stoichiometry to devise a new way to generate combinatorial libraries of reaction sequences that are chemically consistent and can be studied by graph theory. In particular, we will examine the topological structure of reaction networks, assess what properties are needed to obtain small-world or scale-free behavior, if at all.

Brian G. Higgins *received his B.Sc and M.Sc degrees from the University of the Witwatersrand, Johannesburg, and in 1980 his Ph.D in chemical engineering from the University of Minnesota, Minneapolis. Since 1983 has been faculty member in the Department of Chemical Engineering & Materials Science at the University of California, Davis. He was chair of the department from 1988-1996. His principal area of research is the fluid mechanics and stability of thin film coating processes. In 2004 he received the AICHE Tallmadge Award for contributions to coating science and technology. Professor Higgins is active in using computational tools such as Mathematica and webMathematica in his research and teaching endeavors.*

Upcoming Speakers:

10/12	**Didier Sornette**	Endogenous versus exogenous origins of crises
10/20	**Carlos Puente**	From complexity to peace
10/27	**Raissa D'Souza**	TBA
11/3	**Don Turcotte**	TBA
11/10	**Melanie Mitchell**	The prospects and perils of complex systems modeling
11/17	**Michelle Girvan**	TBA
12/1	**Elizabeth Bradley**	Nonlinear dynamics, modeling, and the environmental sciences: ideas and tools

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