

# Signaling Networks, Epigenetic Biochemical States of a Single Cell, and a Possible Second Stochastic Origin of Cancer: Theories and Computational Challenges

Frontiers in Computational and Information Sciences  
Seminar Series

Presented by...

## Professor Hong Qian

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**Abstract:** Professor Qian will discuss implications of a new theoretical narrative of cellular biochemical dynamics on cancer biology and its relation to evolutionary processes; as well as the need for a large-scale computational program to help advance such an approach. The talk will focus on a theory for cellular biochemical processes through integration of biochemical reaction network modeling with a system perspective of a cell. Biochemical reactions in a single cell, particularly those associated with gene transcription and regulation, cell signaling and differentiation, are stochastic in nature. We apply stochastic kinetic models to self-regulating gene networks, phosphorylation / dephosphorylation. and GTPase signaling modules with feedbacks. Dynamic bistability is illustrated in biochemical systems. We argue the fluctuations inherent in molecular processes (e.g., stochastic gene expression, chemical concentration fluctuations, etc.) do not disappear in mesoscopic cell-sized nonlinear systems; rather they manifest themselves as isogenetic variations on a different time scale.

**Bio:** Professor Qian received his B.A. in Astrophysics from Peking University in China in 1982, and his Ph.D. in Biochemistry and Biophysics from Washington University School of Medicine in St. Louis in 1989. His main research interest is the mathematical approach to and physical understanding of biological systems, especially in terms of stochastic mathematics and nonequilibrium statistical physics. In recent years, he has been particularly interested in a nonlinear, stochastic, open system approach to cellular dynamics. In his research on cellular biology, his recent interest is in isogenetic variations and possible pre-genetic biochemical origins of oncogenesis.

**More info:**

<http://depts.washington.edu/amath/people/Hong.Qian/>

**Monday  
March 18**

**BSF 1007  
Darwin Room**

**9:30 am**