

# Whitaker Biomedical Engineering Institute Seminar

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## “SYSTEMS ANALYSIS OF CELLULAR SIGNALING NETWORKS”

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### **Abstract:**

Malfunctioning signaling networks are central features of human diseases as diverse as asthma and cancer. Thus, the reconstruction and mathematical analysis of cellular signaling networks is a pressing challenge. High-throughput technologies including proteomics and transcriptomics will enable the reconstruction of large-scale, cellular signaling networks that are crucial for studying these complex human diseases. These network reconstructions differ in scope and resolution, from causal descriptions of small signaling systems to chemically consistent, stoichiometric equations of large signaling networks. Large stoichiometric reconstructions of signaling networks account for the interconnectivity and functional relationships among numerous cellular components. With these detailed reconstructions, mathematical analysis techniques can describe network properties and their relationships to disease states. I will present state-of-the-art methods for reconstructing and analyzing large cellular signaling networks. Furthermore, I will discuss results from the reconstruction and analysis of the JAK-STAT signaling network in the human B-cell, the largest stoichiometrically reconstructed signaling network to date. With the JAK-STAT signaling network as an example, I will describe mathematically-based network properties including input-output relationships, correlated reaction sets, and network crosstalk. As mathematical analyses of signaling networks develop, I hope to help dissect the complex mechanisms that lead to cancer, the immune response to infectious agents, and a multitude of biological communication systems gone awry.

**Date: Wednesday 8/18/04**

**Time: 11:00 – 12:00 PM**

**Location: 110 Clark Hall**

**Simulcast to Talbot Library,  
709 Traylor Bldg**

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