

BIOENGINEERING

PRESENTS

Mathematical modeling to predict the dynamics of biochemical reaction networks in cancer



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12:00 – 1:00 PM

2101 ENGINEERING V

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USC

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ABSTRACT:

Systems biology approaches, including computational models, provide a framework to test biological hypotheses and optimize effective therapeutic strategies to treat human diseases. My research group works to quantitatively understand the dynamics of key signaling and metabolic networks in cancer, providing a multifaceted approach to improve our understanding of this complex disease. We focus on three particular classes of networks:

(1) **Tumor angiogenesis signaling:** We have produced several models that investigate crosstalk amongst key proteins involved in regulating angiogenesis (the formation of new blood vessels). The models enable us to evaluate the effects of existing therapies that inhibit tumor angiogenesis and to identify novel therapeutic targets.

(2) **Immune cell signaling:** We have modeled the biochemical reactions that regulate chimeric antigen receptor (CAR) mediated T cell signaling. These models provide mechanistic insight into the signaling events initiated by the CAR intracellular domains and offer a quantitative framework that enables optimal design of CAR-engineered T cells.

(3) **Cancer metabolism:** We have constructed dynamic models of metabolic pathways in pancreatic cancer. The models identify new drug targets and simulate the effects of inhibiting specific metabolic reactions.

I will present our latest work in the first two areas, including our recently published whole-body model of the angiogenic balance in cancer patients and new results to predict the kinetics of CAR activation in T cells. This work advances the long-term mission to translate our understanding of these networks and their dynamics into effective therapeutic strategies.

BIOGRAPHY:

Background. Stacey D. Finley is the Gordon S. Marshall Early Career Chair and Assistant Professor of Biomedical Engineering at the University of Southern California. Dr. Finley joined the faculty at USC in 2013, and she directs the Computational Systems Biology Laboratory. Her research group develops mechanistic models of biological processes and applies the models to investigate tumor angiogenesis, tumor metabolism, and cancer immunotherapy. Dr. Finley received her B.S. in Chemical Engineering from Florida A & M University and obtained her Ph.D. in Chemical Engineering from Northwestern University. She

completed postdoctoral training at Johns Hopkins University, in the Department of Biomedical Engineering.

Recent awards. Dr. Finley was named a 2015 Emerging Scholar and a 2016 Keystone Symposia Fellow. Also in 2016, Dr. Finley was awarded an NSF Faculty Early CAREER Award and was selected as a Young Innovator by the *Cellular and Molecular Bioengineering* journal. In 2017, Dr. Finley was named the inaugural recipient of the Leah Edelstein-Keshet Prize from the Society of Mathematical Biology. Dr. Finley was awarded the Junior Research Award from the USC Viterbi School of Engineering and the Hanna Reisler Mentorship Award from the Women in Science and Engineering Program at USC. Most Recently, Dr. Finley was selected as a NextGen Star by the American Association for Cancer Research. Dr. Finley has a joint appointment in the Department of Chemical Engineering and Materials Science and is a member of the USC Norris Comprehensive Cancer Center.