Biological Control Systems: *The Future of Engineering In Medicine*

by

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**Abstract**

The mammalian organism maintains stable, efficient and “near-optimal” performance and *homeostasis* in the face of external and internal perturbations via distinct biological systems ranging from the large-scale *physiological* (nervous, endocrine, immune, circulatory, respiratory, etc.), to the *cellular* (growth and proliferation regulation, DNA damage repair, etc.), and the *sub-cellular* (gene expression, protein synthesis, metabolite regulation, etc). “Biological Control Systems,” a sub-topic of Control Theory, arises from a control engineering perspective of the function, organization, and coordination of these multi-scale biological systems and the control mechanisms that enable them to carry out their functions effectively. In this presentation, we will provide an overview of how physiological life is made possible by control; demonstrate the usefulness of a control engineering perspective of pathologies for diagnosis, design, and implementation of effective treatments—especially for precision (personalized) medicine; and hence make the case for the central role engineering will play in enabling medicine of the future. The concepts and principles will be illustrated using a specific clinical example involving platelet count control for an immune thrombocytopenic purpura (ITP) patient.

**Date:** 4 October 2019 (Friday)  
**Time:** 1630  
**Venue:** Room 1104 (Lifts 31-32)