



BiophysTO Lunchtime Seminar Series

Date

**November 4th 2021
12:00 – 1:00 pm**

Dr. Michael Levin

Biology Department, Tufts University

Developmental bioelectric networks instruct growth and form: from basic mechanisms to electroceuticals

Most of the components of nervous systems - ion channels, gap junctions, and neurotransmitter pathways - existed long before brains evolved. What did tissues think about before there were brains? In this talk, I will first introduce the emerging field of developmental bioelectricity, which has uncovered fascinating ways in which electrical networks made of non-neural cells make decisions about growth and form. Having made the first molecular tools for reading and writing the content of non-neural bioelectric circuits, we found that gradients of slowly-changing resting potentials are instructive prepatterns for gene expression and morphogenesis of the eye, brain, limb, and face. These dynamics mediate anatomical homeostasis during regulative development and regeneration, and sit as a kind of software layer between the genome and the anatomy. I will describe our efforts to crack the bioelectric code, and to understand its plasticity, modularity, and ability to store re-writable information about large scale body geometry. This work has led to the ability to permanently re-write the target morphology of planaria without genomic editing or transgenes, and to applications in limb regeneration, tumor reprogramming, and the repair of birth defects of the brain. Having introduced the tools for modulating non-neural computations, I will discuss examples of how the bioelectrically-stored information guides the behavior of the collective intelligence of somatic cell groups. In addition to the numerous biomedical applications, these data shed light on the origins of cognition, showing how the remarkable capacities of nervous systems could be an evolutionary pivot of much more ancient problem-solving in anatomical morphospace.

Host: Jeremy Rothschild

Zoom Link:

<https://us02web.zoom.us/j/89407663380?pwd=OFBMcZlhWVZKbUswQzk3VXNkLzhGdz09>



**Seminar
Sponsors**

UTSG

Biochemistry

Physics

Chemistry