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## Faculty & Research

### Michael Levin

Professor and Director of Tufts Center for Regenerative and Developmental Biology  
Morphological and behavioral information processing in living systems

#### Education

B.S. Computer Science and Biology, Tufts University - 1992  
Ph.D. Genetics, Harvard Medical School - 1996

#### Research Interests

The capacity to generate a complex organism from the single cell of a fertilized egg is one of the most amazing qualities of multicellular animals. The processes involved in laying out a basic body plan and defining the structures that will ultimately be formed depend upon a constant flow of information between cells and tissues. The Levin laboratory studies the molecular mechanisms cells use to communicate with one another in the 4-dimensional dynamical system known as the developing embryo. Through experimental approaches and mathematical modeling, we examine the processes governing large-scale pattern formation and biological information storage during animal embryogenesis. Our investigations are directed toward understanding the mechanisms of signaling between cells and tissues that allows a biological system to reliably generate and maintain a complex morphology. We study these processes in the context of embryonic development and regeneration, with a particular focus on the biophysics of cell behavior. In contrast to other groups focusing on gene expression networks and biochemical signaling factors, we are pursuing, at a molecular level, the roles of endogenous voltages, pH gradients, and ion fluxes as epigenetic carriers of morphological information. Using gain- and loss-of-function techniques to specifically modulate cells' ion flow we have the ability to regulate large-scale morphogenetic events relevant to limb formation, eye induction, etc. We believe this information will result in important clinical advances through harnessing the biophysical controls of cell behavior.

For information about Professor Levin and his research, please visit his [lab website](#).

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#### Email Michael

Office: Suite 4600  
200 Boston Ave.  
Room #4604  
Phone: 617-627-6161  
Fax: 617-627-6121

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Department of Biology, Tufts University, 163 Packard Ave., Medford, MA  
Tel: 617-627-3195 | Fax: 617-627-3805 | [Department Email](#)

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