MIT Biophysics Special Seminar

Physical Forces Shaping Morphology

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Physical forces can induce long-ranged interactions and thus propagate information on large scales. Especially during the development of an organism, coordination on large scales in short time is essential. My aim is to discover the principal mechanisms of how physical forces induce, transmit and respond to biological signals and thus orchestrate development and shape morphology.

The network-forming slime mold *Physarum polycephalum* lacks any central coordination center, yet it shows often-termed intelligent dynamics in the way it adapts its network morphology. My work investigates the role of fluid mechanics for transport and signal transfer during the morphological dynamics of this network-like slime mold. I combine experimental observations of the fluid flow and its driving force with the development of the theoretical concept of transport by peristaltic flow in a network. This synergy allows me to show that the slime mold actively controls its internal fluid flow by establishing a peristaltic wave. This peristaltic wave always spans the total extent of an individual independent of its size. Thus, I find that the slime mold actively adapts its flows as to maximize transport. The quantitative description of flows in *P. polycephalum* enables a new view on the slime molds growth dynamics during the encounter of food or toxins and how their location can be “remembered”, an important step to perform an informed decision during an individuals network growth and adaptation.

Host: Mehran Kardar
Date & Time: Thursday, February 6@ 10am
Room: 4-331 (Duboc Room)