

BIOCHEMISTRY SEMINAR

J F Foster Memorial Lecture

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“Adaptive bacterial Material”



One of the most common cellular morphologies across nature is the cylinder, rod, or bacillus. To achieve this shape, cells usually reinforce the circumference of the cell to avoid cell widening while allowing elongation. However, it is not known - in any system - how cells homeostatically specify cell width. I will show, first, how the cell wall of Gram-positive bacteria like *Bacillus subtilis* exhibit extraordinary non-linear mechanical properties, including both stress-stiffening and stress-softening in different regimes of intracellular pressure. I will next explain how the cell exploits these properties to adaptively execute cell width homeostasis. Our preliminary studies in plant roots reveal that this generic strategy may appear convergently across many systems. Finally, I will describe why bacteria must plug nanoscopic holes in their cell wall to avoid runaway amorphous growth.

Bio: My research centers on the cell and developmental biology of bacteria, fungi, protists, and plants. My lab interrogates the mechanisms of these complex functions, usually focusing on interactions between molecular scale processes, mechanical forces, and cellular structure. We use physics-based theory to guide experiments. I received my B.A in Physics and Mathematics from the University of Pennsylvania, my Ph.D. in Physics from Harvard University, and performed postdoctoral research at Stanford University.