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# (Keynote) From neurons and plants to elephant trunks The multiscale mechanics of active filaments

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## Abstract

The world around us is filled with structures that respond to external stimuli and adapt their internal structures to perform specific functions. For example, plants have the ability to sense changes in their environment, such as changes in gravity or light, and modify their shape accordingly to survive. During development, neurons respond to their surroundings by growing and connecting different parts of the brain. Additionally, the arms of octopuses and trunks of elephants are stunning examples of the versatility and beauty of responsive structures that inspire the development of soft robotics. In this talk we will first develop a general theory of active filaments, characterized by a solid matrix with embedded active components and suitable to model both biological systems. I will propose a unified mathematical framework to model how multiple stimuli can be combined at the microscopic level to produce changes at the macroscopic level. This framework will allow us to uncover general principles for microstructure organization and activation for filamentary systems.

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