Extreme Mechanics of Growing Matter

Dr. Ellen Kuhl
Department of Mechanical Engineering
Stanford University
Stanford, California

Wednesday, January 29, 2014, 3:30P.M.

Lower Level Auditorium, Geddes Hall

Refreshments served at 3:00 p.m. in the Geddes Hall Coffee House

Growth is a distinguishing feature of all living things. Unlike standard materials, living materials respond autonomously to environmental changes. As a result of a continuous turnover and renewal of cells and extracellular matrix, living systems can undergo extreme changes in composition, size, and shape. However, the precise role of mechanics throughout these processes remains largely unknown. Here we use the nonlinear field theories of mechanics supplemented by the theory of finite growth to explore the extreme mechanics of growing matter. Examples are plentiful ranging from plants to tumors, from the lungs to the vasculature, and from skeletal to cardiac muscle. We discuss the role of mechanics in important clinical applications like asthma, chronic bronchitis, atherosclerosis, restenosis, tissue expansion, limb lengthening, mitral regurgitation, cardiomyopathy, heart failure, and brain development. Understanding the mechanisms of growth in these chronic conditions may open new avenues in medical device design and personalized medicine to manipulate development and alter, control, or revert disease progression.

If you are interested in meeting individually with Dr. Kuhl, please contact Linda at 631-5431.

Midwest Mechanics Seminar Series