

Center for Soft Matter and Biological Physics

Discussion Meeting

Harrison Wood

(Biomedical Engineering and Mechanics, Virginia Tech)

“A study on the effects of in-plane swelling gradients on orthotropic plates”

Friday, October 26, 2018

4:00 pm—5:00 pm

304 Robeson Hall

In this study, we examine the effects of in-plane swelling gradients on resulting shapes of thin, orthotropic plates. Emphasis is placed on understanding how different swelling gradients and orthotropic material properties result in different shapes. This talk focuses on introducing the topic of incompatible elasticity applied to programming swelling functions and shapes in plates, and summarizes the current research of graduate student Harrison Wood on swelling and warping of engineered wood products. Several surface parameterizations are explored to explain warped shapes of orthotropic plates. An energy expression based on mid-plane strains and curvatures is minimized with respect to surface parameters, and competition between stretching and bending energy terms is studied to determine equilibrium shapes. Using some simple toy models of plate warp as inspiration, some scaling arguments are being developed to validate certain behaviors and shapes, such as the case where a specific in-plane swelling gradient results in a cylindrical-like shape at equilibrium for an orthotropic plate.