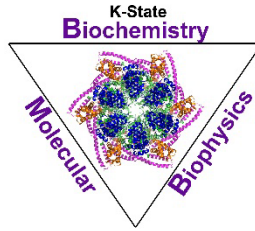


Ackert Hall, Room 120
Wednesday, December 10, 2025
4:00 P.M.



Coffee and Cookies
Chalmers Hall, Room 168
3:45 P.M.

Biochemistry

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Molecular

Biophysics

Seminar

Inflammatory signaling is driven by protein phase change batteries

Dr. Randal Halfmann

Stowers Institute for Medical Research

Cells respond to pathogens via innate immune signaling cascades that frequently trigger cell death and inflammation. These cascades amplify signal through the prion-like assembly of Death Fold Domains (DFDs), but the energetic basis and evolution of such assembly is unclear. Through the characterization of over 100 human DFDs, we identified sequence-specific kinetic barriers that allow central inflammatory adaptors — such as the inflammasome scaffold ASC — to accumulate at high concentrations without spontaneously aggregating. This creates a thermodynamic "loaded spring" effectively storing energy. We show that specific upstream signals act as nucleation triggers, collapsing this metastable state to drive rapid polymerization and immune activation. This study reveals that DFDs act as phase-change materials, autonomously storing energy through supersaturation to power decisive cellular responses on demand.