Cal Poly Pomona

Colloquium Series
Department of
Mathematics & Statistics

Dr. Siyu Li
Cal Poly Pomona

Elasticity in Curved Topographies: Applications to Viral Capsids and Polymeric Shells

Abstract: Most spherical viruses adopt icosahedral capsids with different triangulation numbers. While small viruses can encapsidate their genome into icosahedral cages spontaneously, large viruses, such as Bacteriophage P22, need the help of scaffolding proteins to guide the assembly. In this talk, I will show the mechanisms by which hundreds or thousands of proteins assemble to form structures with icosahedral order (IO). Using continuum elasticity theory, we study the growth of large viral shells and show that a nonspecific template not only selects the radius of the capsid, but also leads to the error-free assembly of protein subunits into capsids with universal IO. Other than the crystalline protein shells, I will also talk about the polymeric shells that are responsive to the chemical stimulus. By coupling the mechanical properties of the shell with a periodically reduction-oxidation reaction, I will show how the pattern and morphology of the shell can be selected leading to a self-powered shell. The morphology and patterns we studied will provide a straightforward design for new materials with desired functionality and shed light on the mechanism of the living system.

September 29, 1:05-1:50, 3-1639

Join remotely via Zoom: https://cpp.zoom.us/j/84908036425