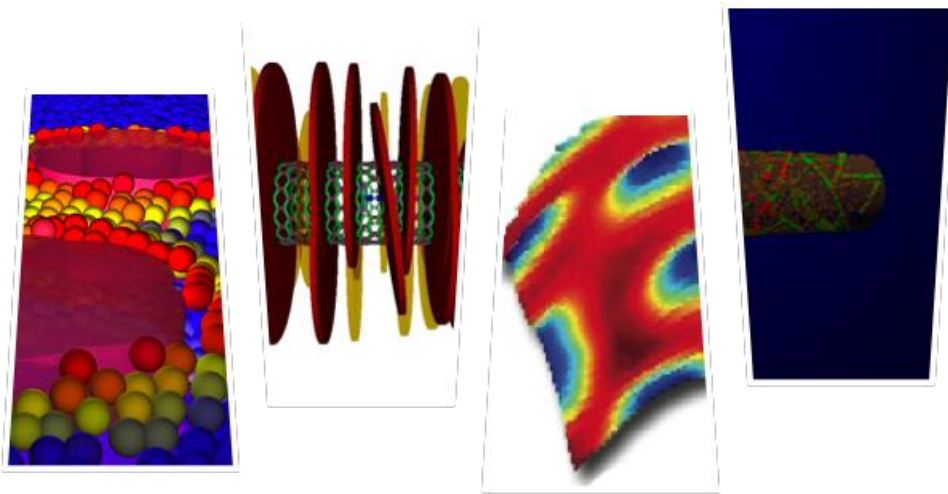


Huang Laboratory of Cellular Organization

Rapid technical progress and recent discoveries in molecular biology have brought biologists face-to-face with the importance of understanding fundamental physical phenomena in living cells. Nowhere is this more evident than in bacteria, whose exquisite organization varies in both space and time as the cell grows. However, even very basic questions remain unanswered: *How do cells grow? How do they determine their shape? How do their components get to the right place at the right time?*



Focus:

Our group uses a systems biology approach, in which we integrate interacting networks of protein and lipids with the physical forces determined by the spatial layout of the cell. We use theoretical and computational techniques to make predictions that we can verify experimentally using synthetic, chemical, or genetic perturbations.

We primarily focus on bacteria, in which the exquisite patterning of the interior in both space and time is critical for a wide variety of cellular functions. The wide variety of shapes and sizes that bacteria take on can be used as synthetic environment for studying the establishment of intracellular organization and the cellular response to perturbations in morphology. Ultimately, the manipulation of cell shape may provide a direct tool for engineering complex cellular behaviors.

Areas & Systems:

Currently, we are interested in

- (i) the role of the cell wall in cell-shape determination
- (ii) the regulation and mechanics of cell division
- (iii) the spatial and temporal organization of the membrane
- (iv) the role of the membrane in transmembrane-protein interactions and ion channel gating.

Ultimately, our goal is to investigate fundamental questions of how cells determine their shape and how they utilize shape to regulate complex intracellular processes.