

Bacteria like *Escherichia coli* and *Salmonella Typhimurium* use flagella for locomotion. Each flagellum is run by a motor located in the cell body, with a long slender filament of 0.01-0.015mm long and 20nm in diameter attached to this motor. A swimming bacterium has all its filaments helical in shape involving a frequent change of their chirality, pitch and radius. To explain polymorphism, a new coarse-grained continuum rod theory with two molecular switches based on the quaternary structure of the filament is proposed. A phase diagram for filament shapes is calculated and the response of a filament to external moment and force is examined. To study the dynamics of the propagation of polymorphism in the filaments, a toy model with an external tensile shear fluid flow applied to a bistable cantilever 1D rod was modeled on the lines of phase transitions and simulations is performed using finite element techniques. Interesting results like nucleation of high-strain phase leading to either a trapped front separating two phases or uniform high-strain phase at steady state are observed.



Srikanth Srigiriraju

Srikanth Srigiriraju received his Doctorate in Engineering in the discipline of Solid Mechanics from Brown University where he focused on the modeling of mechanics of bacterial flagella. He also received a Masters from Brown University in Applied Mathematics and a Bachelors in Mechanical Engineering from Indian Institute of Technology, Madras.



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