

Problems in interfacial fluid mechanics and tissue mechanics

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Thursday, January 28, 2016

Abstract

Moving boundary problem in fluid mechanics. We study the effect of external electric fields or soluble surfactants on the interfacial dynamics of liquid threads or droplets, which has extensive industrial and engineering applications, such as ink-jet printing, particle sorting, drug delivery etc. Through direct numerical simulations and asymptotic analysis, we are able to investigate and explain the solution phenomena that are observed from simulations and experiments. The other part is concerned with tissue mechanics, where we show modeling and simulations to probe the role of actomyosin cytoskeleton in epithelial morphogenesis in *Drosophila* dorsal closure and cell intercalation during *Drosophila* Germ-band extensions. Agreements are shown between model predictions and experiments.

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