

EML WEBINAR



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DYNAMICS OF COLLECTIVE CELLS

Cell dynamics is of crucial significance for the morphogenesis, self-repair, and other physiological and pathological processes of tissues. Collective cells exhibit greatly different dynamic behaviors from isolated cells. In this lecture, some recent advances in experimental and theoretical researches on collective cell dynamics will be presented, with particular attention paid to the biomechanical mechanisms underlying the morphodynamics of developing embryos and tumors. First, a cell division model is established for the division of interconnecting cells in a biological tissue. Coupled mechanical-chemical mechanisms involved in the multi-phase cell division are taken into account. Second, we explain why spontaneous oscillation of collective cells may occur in such biological tissues as *Drosophila amnioserosa* during development. It is revealed that the collective cell oscillation in an epithelium-like monolayer results from the dynamic bifurcation induced by feedback between mechanical strains and chemical cues. Further, we investigate, both experimentally and theoretically, the migration of collective cells. We show that migratory cells may behave as a whole either like a viscous solid or fluid, leading to rich patterns with characteristic sizes ranging from several to dozens of cells. On the basis of experimental measurements and theoretical analysis, universal statistical laws are derived for the dynamic features of collective cells.

Xi-Qiao Feng is a Changjiang Chair Professor at Tsinghua University. He received his degrees of bachelor (1990), master (1991) and doctor (1995) of solid mechanics from Tsinghua. During 1997–1999, he worked as a Humboldt research fellow at TU Darmstadt and TU Delft. Then he rejoined Tsinghua University as an associate professor in 1999 and was promoted as a professor in 2001. Currently, he serves as a vice president of the Chinese Society of Theoretical and Applied Mechanics (CSTAM). He is an editor-in-chief of *Engineering Fracture Mechanics*, and serves as an editorial board member of *Applied Physics Letters*, *Journal of Applied Physics*, *Acta Mechanica Sinica*, and several other journals. His research interests mainly include damage and fracture mechanics, biomechanics and biophysics of cells, tissues and biological materials. He has authored three monographs and ~350 papers in peer-reviewed international journals. Selected honors include a National Natural Science Prize (2019), Distinguished Young Scholars Award of NSFC (2005), etc

Discussion leader: Professor Wei Yang, Zhejiang University

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