

Modelling collective cell movement in biology and medicine

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Abstract

One of the big challenges in modelling multiscale phenomena is understanding how to relate macroscopic properties to microscopic processes, and how different assumptions on the micro-scale affect macro-scale behaviour. In this talk, I will investigate this problem in the context of collective cell movement. Collective cell movement occurs throughout biology and medicine and there are many common features shared across different areas. In particular, there is the phenomenon whereby a group of informed cells (so-called "leaders") signal to other cells (so-called "followers") to move in a coherent stream. I will review recent work in which we revisited the classical snail-trail model, proposed for fungal growth and tumour-induced angiogenesis (formation of blood vessels), and systematically derived a new partial differential equation model, which is then compared with the classical model in the literature.