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The Hong Kong University of Science and Technology

Department of Mathematics

Seminar on Applied Mathematics

Numerical methods for tumor growth models and chemotaxis models

By

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Abstract

In this talk, I will present some of recent work on the tumor growth equation along with various models for the nutrient component, including the in vitro model and the in vivo model. At the cell density level, the spatial availability of the tumor density n is governed by the Darcy law via the pressure $p(n) = n^m$. As m goes to infinity, the cell density models formally converge to Hele-Shaw flow models, which determine the free boundary dynamics of the tumor tissue in the incompressible limit. We derive several analytical solutions to the Hele-Shaw flow models, which serve as benchmark solutions to the geometric motion of tumor front propagation. I will also present a closely related model which is governed by the Keller-Segel equations. This type of equations describes the chemotaxis phenomenon that underlies many social activities of micro-organisms at the macroscopic level. In this talk, I will propose an efficient, conservative and positivity-preserving numerical scheme for both models with classical (m=1) and degenerate diffusion (m>1) that aims to capture

1) quasi-static limit in the transient regime;
2) long time behavior; and
3) large m limit.

The numerical results verify the link between cell density models and the free boundary dynamical models. This is joint work with Min Tang, Li Wang and Zhennan Zhou.

Date: ***Tuesday, 27 June 2017***

Time: ***10:00a.m. – 11:30a.m.***

Venue: ***Room 4475, Academic Building (near Lifts 25&26), HKUST***

All are welcome!