First Principle Modeling of Biological Transportation Networks

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Date   : 30 November 2017 (Thursday)
Time   : 3:30pm – 5:00pm (Light refreshments will be served from 3:00pm to 3:30pm)
Venue  : F.A.M. Lecture Theatre (LT-8), 4/F, Yeung Kin Man Academic Building,
         City University of Hong Kong

Abstract

We present a modeling framework for biological transportation networks, based on nonlinear partial differential equations. The models are based on physical laws from porous media flows (fluid networks) and, resp. electrodynamics and ion transport theory (neuronal networks). The main feature of the presented theory and difference to other existing models is that network formation is described as an emerging phenomenon, whose evolution is governed by the interaction of the material transport with the background medium. We discuss (in)stabilities, pattern formation and long time behavior of the model solutions. Typical examples are leaf venation, neuronal networks and blood vessel systems (angiogenesis) in mammals.

Biography

Peter Markowich is Distinguished Professor at KAUST (Saudi Arabia). His research is in Applied Mathematics, in particular in the partial differential equations which arise in applications. He follows an ‘integrated’ approach, involving mathematical analysis, numerical analysis, computational mathematics and mathematical modeling. Peter Markowich has held distinguished posts throughout the world and has achieved results - published in the highest quality international journals - with relevance to important problems in the applied sciences and technology. Peter Markowich is the recipient of many international awards, among them the Wittgenstein Award of the Austrian Science Fund, the Royal Society Wolfson Research Merit Award and the Humboldt Research Award. He was plenary and invited lecturer at the most important conferences in mathematics and he is a Foreign Member of the Austrian Academy of Sciences.

Online registration: www.cityu.edu.hk/ias/event