ANALYSIS/PDE SEMINAR SERIES

TOPIC: A Kinetic Theory of Birth, Death, and Fission of Age-Structured Populations

SPEAKER: Tom Chou, University of California, Los Angeles (UCLA)

TIME: 1:30pm-2:30pm, Thursday, December 14, 2017

VENUE: Room 264, Geography Building, Zhongbei Campus
(中北校区，地理楼264室)

HOST: Laurent Mertz, NYU Shanghai

ABSTRACT OF THE TALK

Classical age-structured mass-action models such as the McKendrick-von Foerster equation have been extensively studied but they are structurally unable to describe stochastic fluctuations or population-size-dependent birth and death rates. We present a semi-Markov stochastic model of populations that incorporate age-dependent birth, death, and fission rates. By defining multiparticle probability density functions, we derive a hierarchy of kinetic equations for the stochastic evolution of an aging population undergoing birth, death, and fission. We show that the fully stochastic age-dependent birth-death process precludes factorization of the corresponding probability densities, which then must be solved by using a BBGKY-like hierarchy. Our results generalize both deterministic models and existing master equation approaches by providing an intuitive and efficient way to simultaneously model age- and population-dependent stochastic dynamics applicable to the study of demography, stem cell dynamics, and disease evolution.

BIOGRAPHY

Tom Chou is Professor in the Department of Biomathematics and the Department of Mathematics at UCLA, Los Angeles. Professor Chou holds a Ph.D. in Physics from Harvard University. He works on applied math, mathematical biology, theoretical soft condensed matter, and statistical mechanics problems.