MATH-IMS Joint Pure Mathematics Colloquium Series
The Chinese University of Hong Kong

This Colloquium Series in Pure Mathematics is organized by the Department of Mathematics and the Institute of Mathematical Sciences (IMS) at The Chinese University of Hong Kong. The series focuses on all areas of pure mathematics together with theoretical developments and applications.

Date: November 18, 2022 (Friday)
Time: 9:00AM-10:00AM (Hong Kong Time)
Zoom Link: https://cuhk.zoom.us/j/98846779826

Frustration in the Packing of Soft Materials

Speaker: Professor Keith Promislow
Michigan State University

Abstract: Many processes in material science involve entropic contributions from packing – the constraints imposed by volume occupied by other material. Diblock polymers offer a rich environment to study the packing of soft materials as gradient flows of a system energy. Ideas from Γ convergence provide powerful tools to extract simplified models in certain singular limits. We present examples of packing dichotomies in both continuous and discrete formulations and identify cases in which limiting problems may be more complex. We present a derivation of a random phase reduction of self-consistent mean field models, identify regimes in which they converge to functionalized Cahn-Hilliard energy, and provide a discrete system for the packing of soft balls that exhibits large-system frustration: the inability of gradient flows to obtain the global energy minimum, that significantly complicates the extraction of limiting processes.

Bio: Professor Promislow is working in the aspects of applied mathematics and material science. His research interests are broad. They include the functionalized Cahn-Hilliard energy, Hookean-Voronoi energy, and the dynamical problems describing nonlinear optics. He is trying to understand patterns, particularly the way how they are formulated, in different physics models. Professor Promislow obtained his PhD from Indiana University in 1991. Thereafter, he worked in University de Paris XI, PSU, Simon Fraser Univ., Brown, and MSU. Since 2014 till now, he has been serving as the chair at the mathematics department of MSU for 8 years. In 2022, due to his excellent research in applied mathematics, he was elected as Fellow of Society for Industrial and Applied Mathematics.